

COMPTON'S PICTURED ENCYCLOPEDIA AND FACT-INDEX

INTERESTING · ACCURATE · UP-TO-DATE



*To inspire ambition, to stimulate the
imagination, to provide the inquiring
mind with accurate information told in
an interesting style, and thus lead into
broader fields of knowledge—such is
the purpose of this work*

VOLUME 5

F. E. COMPTON & COMPANY · CHICAGO

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1938, 1939, 1940, 1941,
1942, 1943, 1944

Here and There in This Volume

AT ODD TIMES when you are just looking for "something interesting to read," without any special plan in mind, this list will help you. With this as a guide, you may visit far-away countries and watch people at their work and play, meet famous persons of ancient and modern times, review history's most brilliant incidents, explore the marvels of nature and science, play games—in short, find whatever suits your fancy of the moment. This list is not intended to serve as a table of contents, an index, or a study-guide. For these purposes consult the Fact-Index and the Reference-Outlines.

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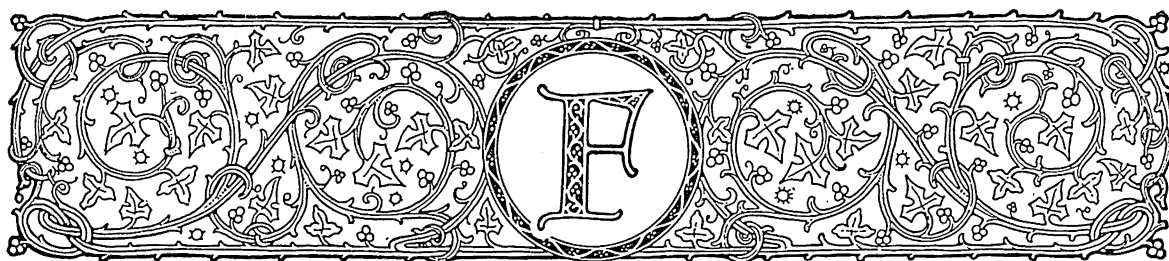
HERE AND THERE IN THIS VOLUME

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Key to Pronunciation

Pronunciations have been indicated in the body of this work only for words which present special difficulties. For the pronunciation of other words, consult the Fact-Index. Marked letters are sounded as in the following words: *cāpe, āt, fār, fāst, whāt, fall; mē, yēt, fērn, thēre; ice, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rūde, full, bārnr; ü = French u, German ü; gem, gō; thīn, then; ñ = French nasal (Jean); zh = French j (z in azure); K = German guttural ch.*



FABRE (*fä'br*), JEAN-HENRI (1823-1915). At dusk the French peasants peered over the hedge and gazed pityingly at the old man seated on a stone watching a wasp's nest. "He has been there since dawn," they whispered as they went on their way, tapping their foreheads significantly. "Poor innocent!"

Henri Fabre, the object of their pity, did not hear them, did not stir. For the wasp nest to this great

French naturalist was a wonderful geometrical home with a modern stucco front; with portico, vestibule, galleries, nurseries, spacious dining rooms and well-stocked pantries; with decorative twisted cords here and there looking like delicate gold lace—it was a setting for certain tiny creatures who revealed to him the secret of their acts, the mystery of their lives, of their food and battles, of their loves, and even of their death.

From the time he was five years old and was trying to find out how the cricket chirped, Fabre was greatly interested in the tiny insect guests of plants and brambles, stones and sands. But born of humble illiterate parents, he early had to struggle with poverty, and was so busy peddling lemons on the market place, working with a gang of railway laborers, and in between times studying hard at school, that he had but little time to give to the world of nature he loved so well. When he was 19 he left the College of Rodez and took charge

of a primary school at Carpentras, receiving a salary of only \$140 a year. His very first month's salary was spent in buying a book on insects, and, as he afterwards put it, "While I turned the pages for the hundredth time a voice whispered vaguely, 'Thou, too, shalt be a historian of animals.'"

Fabre married early and soon had a large family to support with the small salary received as Professor

of Natural Philosophy at the College of Ajaccio in Corsica, and later at the Lycée of Avignon in southern France. His was a long life of great poverty, sacrifice, struggle, and superb perseverance, his principal works being published between the years 1862 and 1880.

At last, after 40 years of unceasing toil, he retired to a humble home in Sérignan, Vaucluse, where he could give himself without reserve to his insects' paradise. Here he remained for the rest of his life contemptuous of riches, indifferent to worldly honors, sacrificing everything to his work, and gaining a knowledge of insects unequalled by any other naturalist. Until nearly 80 years old he was almost unknown to the world. Then the poet Mistral interested some scientists in him and rescued "the Insect's Homer" from poverty and obscurity. His

greatest work, 'Souvenirs entomologiques', was finally crowned by the French Academy and five years

THE NATURALIST AND THE PHILOSOPHER



Fabre, the "Homer of the Insect," was a student of things rather than of books, while John Stuart Mill, the eminent English philosopher and political economist, was a broad-minded man of books—knew the Greek alphabet at the age of three and at eight read Xenophon and Plato. But there was a strong feeling of sympathy between the keen-eyed Frenchman and the meditative Englishman, who are here shown together on a hillside near Fabre's home in France, looking at a butterfly.

before his death the French government granted him a pension.

During his long life this great naturalist, the friend of scientists and little children, whom Darwin called "a savant who thinks like a philosopher and writes like a poet," wrote many books, enthusiastic records of his patient observations. He poked into the private lives of "Bugland" citizens and revealed what he saw in stories curious, quaint, happy, or tragic, as charming as fairy tales. How delightful they are, these tales of the spider who begins his career in a tiny flying-machine; of the praying mantis whose frightful aspect deprives its victim of the power to move; of the wasp who has David and Goliath-like battles with the caterpillar; and of the tarantula in her donjon tower lying in wait for her prey, her eight eyes gleaming in the dusk! And Jean-Henri Fabre records these tales with a touch of mystery, knowing that life even in the insect world obeys and reveals the supreme law.

Among Fabre's principal works as translated into English are: 'Social Life in the Insect World' (1912); 'The Life of the Spider' (1913); 'The Life of the Fly' (1913); 'Bramble-Bees and Others' (1915); 'The Life of the Grasshopper' (1917); 'Our Humble Helpers' (1918); 'The Wonders of Instinct' (1918), and 'The Mason Wasps' (1919).

FACTORIES AND FACTORY LAWS. A billion slaves toiling every day from sunrise to sunset, but using the spinning-wheels and hand-looms of 200 years ago, could not make as much cloth in a year as is turned out in a week in the great cloth factories of today. This is the estimate which a careful historian gives of the enormous increase in man's productive power through the invention of machinery and the organization of the present-day factory system of manufacturing.

In the articles on Spinning and Weaving, on the Industrial Revolution, and in the sketches of the inventors,—James Hargreaves, Richard Arkwright, Samuel Crompton, Edmund Cartwright, James Watt, and others—you may read of the first steps in 18th century England which brought about this tremendous revolution. Manufacturing now is no longer carried on by workmen in their own homes, who use their own tools and raw materials, work when and how they please, and have their little plots of ground from which to supplement the earnings of their trade. In place of the simple hand tools such as had been used for hundreds or thousands of years, they now use vast and complicated machines, housed in giant factories and driven by water-power, steam-power, or electricity. Instead of a single workman making an entire pair of shoes, the process is so subdivided that 250 persons have part in its production. The machines, buildings, and material moreover belong to some person or group of persons who supply the money or "capital," the business is conducted by executives who have the skill necessary to make the enterprise profitable, and the workmen are merely employees, dependent usually for their sole support upon the "wages" which they receive.

The English at first jealously guarded the secrets of their inventions. Machines were not allowed to be shipped from England, and even sending plans abroad was forbidden. For this and other reasons, the factory system developed later in other countries, including the United States, than in Great Britain. But in 1789 Samuel Slater, a young English workman, came to America and from memory drew the plans for and superintended the setting-up of a cotton mill in Rhode Island (*see Rhode Island*). It was not until 30 years later that the factory system began to develop in France, Germany, and other countries of continental Europe.

As a result of the factory system, prices of all manufactured articles have dropped and conditions of life have improved. The worker has shared to some extent in this betterment. His food and clothing are better, opportunities for education are wider, chances for advancement are more numerous.

At first, however, the factory caused much suffering among the laboring class. Its untiring swiftly moving machinery did away with the need for a host of workers. Moreover, since women and children could operate the machines as well as or better than men, and their labor could be obtained for less wages, thousands of men were thrown out of employment and wages became pitifully small. Working hours were frightfully long. Children as young as five and six toiled from 10 to 15 hours a day; women worked from 12 to 16, and men up to 18, hours a day. Factory work also was monotonous and depressing, and the conditions under which it was carried on were usually unhealthful. Men became nervous, diseased, and vicious. Babies of factory women, lacking care, died in alarming numbers. The little children who were employed in factories were pale and sickly, and if they survived, grew into nervous, stunted, depraved men and women, who were dangerous elements in the national life.

But such conditions could not last. In 1833 the employment in factories of children under nine years of age was prohibited by the British Parliament. The hours of older children were greatly shortened, and provision was made that all children under 13 should attend school at least two hours a day. Other British laws were passed limiting the working hours, improving sanitation, providing for safety devices on dangerous machinery, prohibiting night work for children and all work in mines for both women and children, and establishing minimum wages.

If the factory system and its evils first arose in Great Britain, it should not be forgotten that the legislation to remedy these evils began there also. In other countries, including the United States, similar laws have been enacted, and in almost all factories today working conditions have greatly improved over former years. Only in far-off Japan, and other countries where the factory system was late in coming, do the conditions now resemble the terrible ones which prevailed in England at the beginning of the 19th century (*see Child Labor Laws*).

FAIRIES. "Do you believe in fairies?" asks Peter Pan of the audience in the fourth act of Barrie's charming play. In the faces of young and old there is the same answer, for so real do the fairies seem that for the moment we all believe in them. If we can almost believe in fairies today we need not wonder that people of earlier times, who did not have science to explain the strange and wonderful things of the world, felt so certain of the existence of such supernatural beings.

Fairies were supposed to be of almost any size or appearance, and many of them had the power to transform themselves into the shapes of animals. Most often imagination pictured them with the form of human beings, but very, very small—"a few inches high, airy and almost transparent in body; so delicate in their form that a dew-drop, when they chance to dance on it, trembles, indeed, but never breaks."

Related to the fairies are the *gnomes* or *kobolds*, ugly little creatures who live underground and guard the earth's stores of jewels and precious metals; the frolicsome *elves*; the *brownies*, who love mischief but will perform many helpful tasks for the family that is kind to them; the *kelpies* and *nixies*, who are water fairies and lure men to their death in the depths of beautiful streams; and the *trolls*, who are familiar and friendly, but often mischievous dwarfs. There are good fairies and bad fairies, but most of these little people are kind to those who do right and who are good to them, and punish those who are wicked or who offend them.

We find fairies in the folklore of almost all peoples. Some of the most beautiful and fanciful of our fairy tales come from Ireland, and in many parts of that land the country folk still believe in "the good people," as they call these little sprites. In English folklore Oberon is represented as the king of the fairies, and Titania as their queen.

FAIRS AND EXPOSITIONS. When a nobleman of the 13th century needed a new sword, or his lady a new gown of state, or his peasants a plowshare or other tool, where did they get them? Towns were far apart, and usually contained only a few small shops in which merchants displayed the wares made by their journeymen and apprentices in their own workrooms. So both nobles and peasants would usually wait to supply their varied needs until the time of one of the great annual fairs, held in certain privileged cities commonly at the time of a great church festival. Then, on foot and on horseback, they hurried to the town, to gaze in wonder at the marvelous goods from far and near displayed in the booths, and to buy such of them as they needed or fancied and their purses would allow.

But what a different aspect the town wore at such a time from its ordinary appearance! The narrow streets were lined with wooden booths and stalls, or perhaps a special inclosure was set aside for the fair at the city's gates. Here were woollen cloths from Flanders, and there costly spices from the East, with

silks and velvets of wondrous hues. From Gascony came wine, from Norway tar, and from Germany furs and amber. Here was the street of the goldsmiths, and there those of armor-smiths, weapon-makers, saddlers, and the like. In a certain stall could be purchased the sacred relics so much valued for warding off disease. And at the end of the street, on raised platforms, jugglers and tumblers performed their feats of skill, the puppets of a Punch and Judy show drew about them crowds of admiring beholders, and ballad singers sang their lays. Everywhere crippled or blind beggars reaped their harvest of coins from spectators and bystanders.

The lord whose right it was to hold the fair levied fees and tolls upon the merchants, in return for which various privileges were granted them. Disputes were settled summarily by the "Court of Piepowder" (French, *pied poudreux*, meaning "dusty foot"). Quick justice was dealt out not only to all who broke their agreements but also to those who cheated their customers—such, for instance, as the man caught selling a ring of brass for one of "purest gold that he and a one-eyed man found on the last Sunday in the Church of St. Ives near the Cross."

For a week or two the buying and selling, the dancing, the gambling, and the amusements in general continued. Then the merchants packed up their wares, and with a motley vagabond train of all nationalities moved on to another fair. The peasant, with wife and children, trudged home with their purchases; and the knight and lady rode home with falcons on their wrists, their spices and silks carried by their faithful attendants, to take up again the dull life of their castle.

The right to hold such a fair was one of the most highly prized privileges in the Middle Ages, and it was one which could be obtained only by a charter from the king or other lord. Among the most famous fairs were those of St. Bartholomew at Smithfield (just outside of London), the Leipzig fair in Germany, and that of Troyes in France. From the weights used at the latter we get our system of "Troy" weights, and from the laws and customs in force at these fairs we get the beginnings of our system of commercial law.

To many towns which did not have a fair, and also to some which did, was granted the privilege of holding a market on a certain day of the week. Here were sold homespun linens and cloths from the local weavers, as well as the squawking geese, cackling hens, squealing pigs, and wheat and rye brought by the peasants from nearby villages. In many respects it reminds us of the markets you may see in many of our cities today, to which farmers bring their produce on a set day or days of the week.

The medieval fair survives in some sections where commerce is still primitive, as in the interior of Asia. The great fair of Nijni-Novgorod in Russia, which was not abolished until 1930, used to draw from 100,000 to 200,000 persons from many parts of Asia and eastern

Europe. The great Leipzig trade fairs sometimes draw a quarter of a million people. Many fairs have become specialized, offering for sale only one or a few kinds of commodities.

In the Orient, the great fairs are held at the same time as religious ceremonies. Thousands of pilgrims gather each year at Mecca, the Holy City in the hills, 45 miles from the Red Sea, a natural center of the desert caravan routes. There, after a week of ceremonial and feasting, the merchants and desert traders meet in the sacred mart to exchange gems, precious oils, hides, and drugs. India's largest annual fair is held at Hardwar, on the Ganges, in northern India.

The modern world's fairs have little in common with medieval and oriental fairs, for they are exhibits of the industries of the world and the progress of invention, and not places for buying and selling. Many such world's fairs, or international expositions, have been held since the first took place in the great Crystal Palace Exhibition at London in 1851. In America the most important have been the Centennial Exposition at Philadelphia in 1876, the Columbian Exposition at Chicago in 1893, the Pan-American Exposition at Buffalo in 1901, the Louisiana Purchase Exposition at St. Louis in 1904, the Lewis and Clark Exposition at Portland in 1905, the Alaska-Yukon-Pacific Exposition in Seattle in 1909, the Panama-

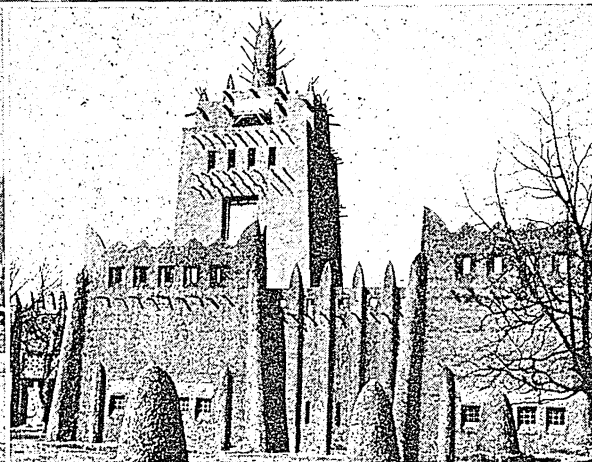
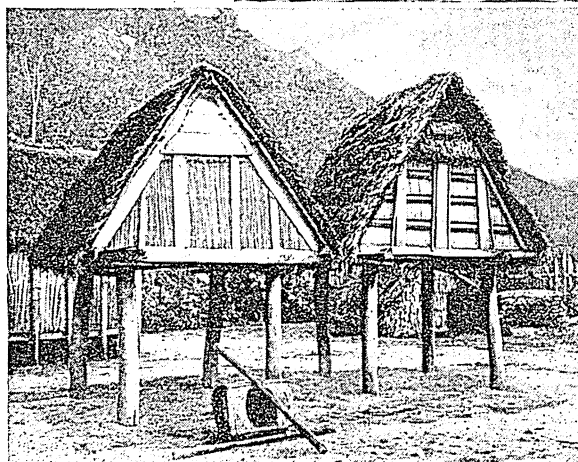
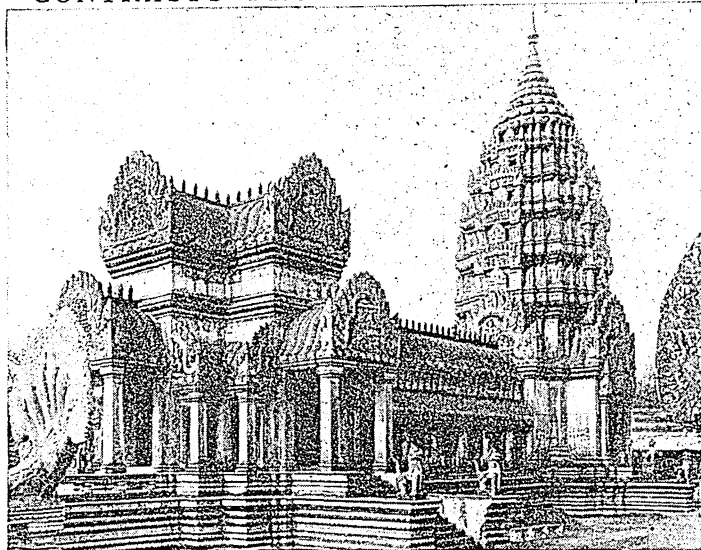
Pacific Expositions at San Francisco and San Diego in 1915, and the Sesquicentennial (150th anniversary of American Independence) at Philadelphia in 1926. Progress of the Southern states since the Civil War was depicted by the South Carolina Interstate and West Indian Exposition held at Charleston from December 1901 to June 1902; and the Century of Progress Exposition at Chicago in 1933.

History of the United States Fairs

Fairs in America date back to colonial days. One of the first was held at New Haven, Conn., in 1644, with exhibitions of agricultural products and live stock. Other fairs followed at Burlington, N. J., in 1681; at Rye, N. H., about 1726; and at Baltimore, Md., in 1747. A semi-annual fair at Strawberry, Berkeley County, S. C., was established by an order enacted in 1723. Similar events were authorized by law at Alexandria, Va., in 1742, and at Georgetown, Md., in 1751, with horse-racing and other events.

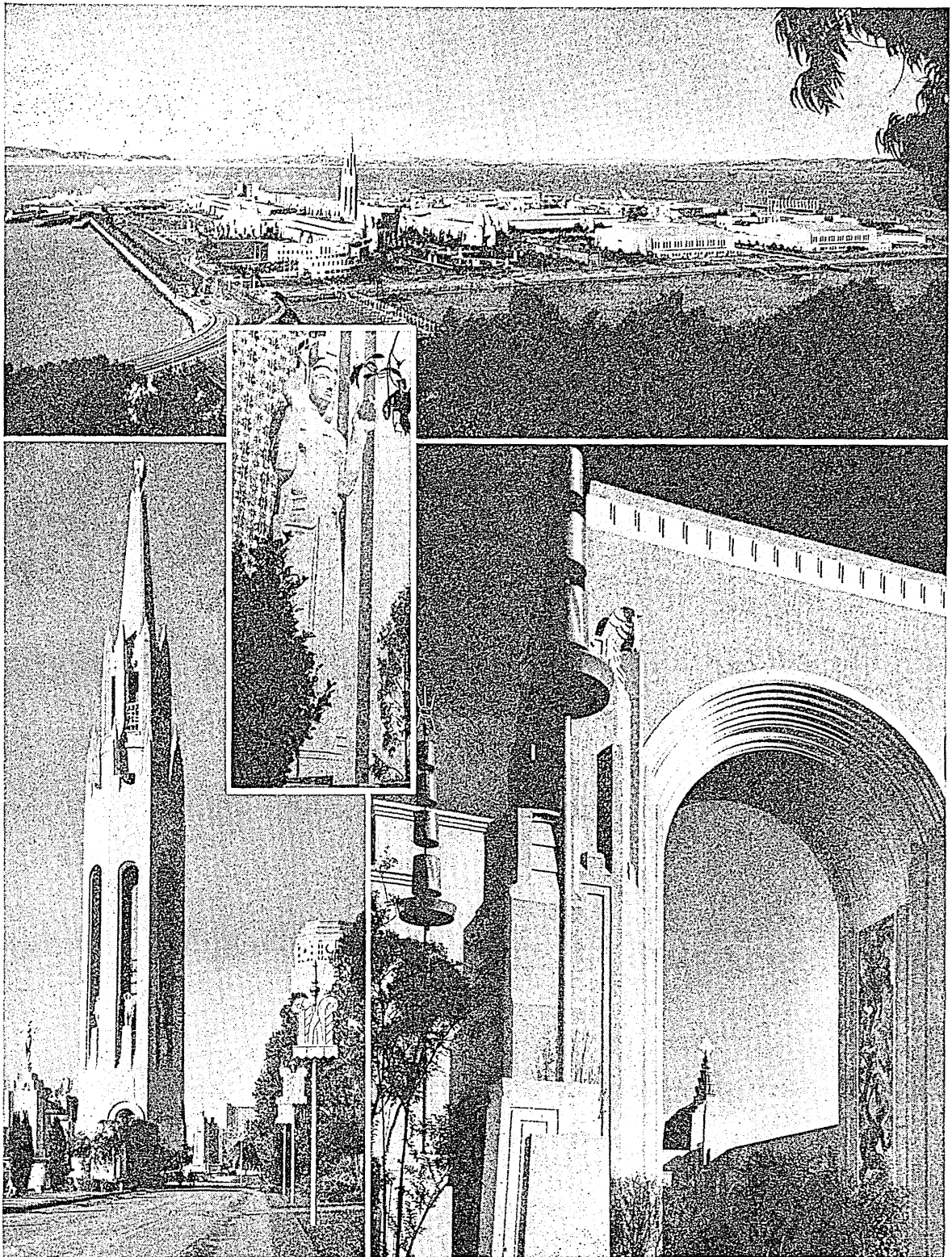
The first fair held after the formation of the United States was sponsored by William Thornton, first commissioner of patents, at Washington, D. C., in 1804. Three years later, Elkanah Watson set out to interest farmers in a cattle show, which he finally promoted in 1810 at Pittsfield, Mass. In 1816 Watson returned to his native state, New York, and his cattle shows in Otsego and Jefferson counties

CONTRASTS FROM FRENCH COLONIES



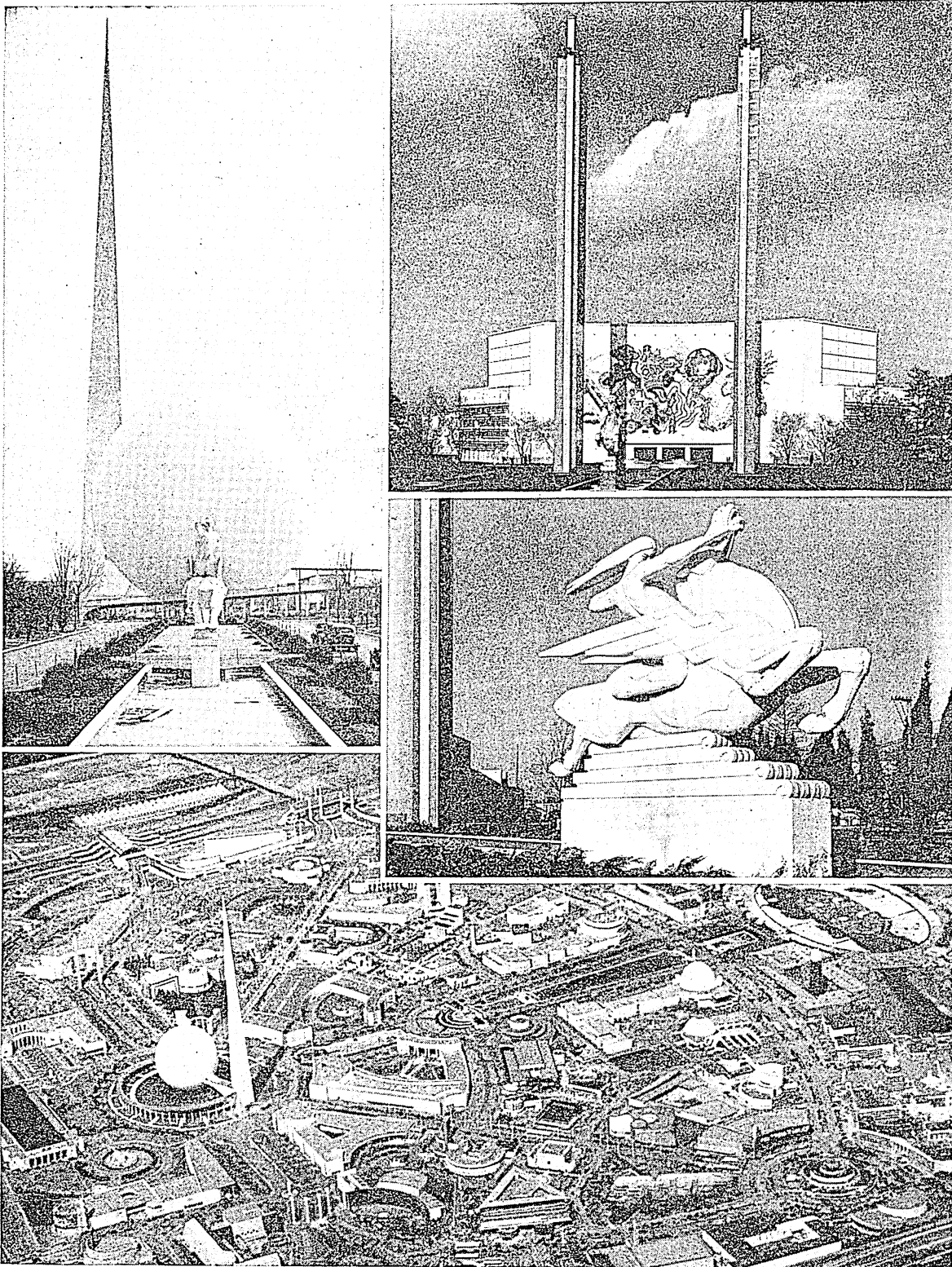
The architecture of France's colonies was skilfully reproduced at the Paris Exposition of 1931. With amazingly clever artisanship the elaborate Cambodian temple Angkor Vat (above) was built. Rice storage huts like those at the left dot the island of Madagascar, where natives build their houses in much the same fashion—set on piles and with bamboo walls. The tower and mud wall at the right are a reconstruction of the village of Djenné, in French West Africa. Mud is the usual building material in this region.

GOLDEN GATE INTERNATIONAL EXPOSITION



The exposition which opened at San Francisco in February 1939 was hailed as a triumph of beautiful design and artistry. At the top we see its picturesque setting on Treasure Island in San Francisco Bay. This is said to be the largest man-made island in the world, which was prepared for later use as a flying field. Next is Ralph Stacpole's 80-foot figure of 'Pacifica—Goddess of the West', dominating a great court of statues. Below, at the left, rises the 400-foot Tower of the Sun, central point of the exposition. At the right is the great Arch of Triumph leading from the Court of Flowers to the Court of Reflections.

NEW YORK WORLD'S FAIR



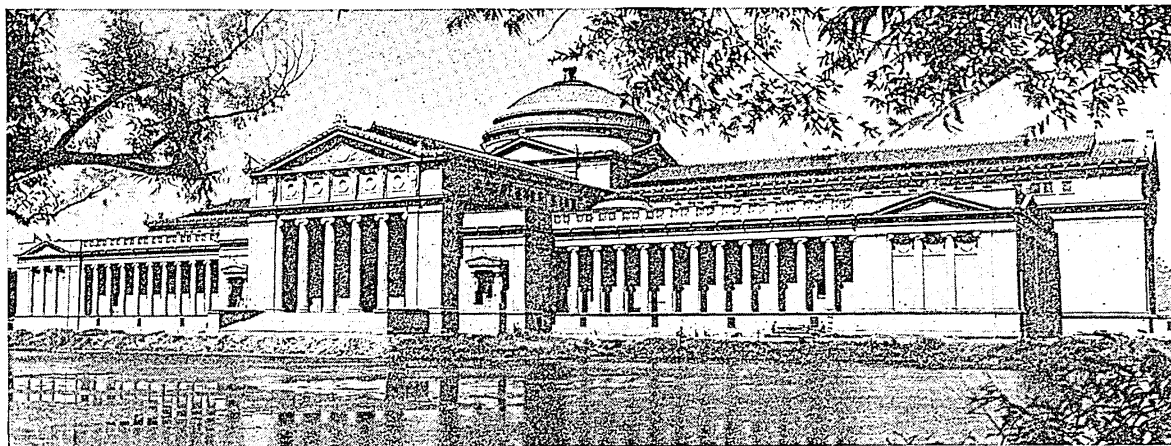
The biggest exposition ever held in America opened April 30, 1939, in the Flushing district of New York City, where marshes were filled to make the fair site. Top, left, is the 700-foot Tylon flanked by the 200-foot Perisphere, dominating the fair grounds and symbolizing 'The World of Tomorrow'. The picture at the right shows the entrance to the great Hall of Communications, covering an acre of ground. Below is Joseph Renier's figure of 'Speed' in front of the Hall of Communications, one of the many statues created for the occasion. The picture at the bottom gives a general view of the exposition from the air.

created so much interest that Governor Clinton suggested the establishment of a state board of agriculture to promote county agricultural organizations. Such a board was established by law in 1819.

Today the state and county fairs held in the United States are generally based upon agriculture. Every

centered about the products of its own colonies. Among the exhibits of foreign countries was the American group, which was housed in a full-sized replica of Mount Vernon, the home of Washington. Of this type also was the Ibero-American Exposition of Art, Commerce, and Industry, held at Seville,

A LASTING MEMORIAL OF THE COLUMBIAN EXPOSITION



Perhaps the world's finest example of an exposition building was the Fine Arts Building of Chicago's Columbian Exposition of 1893, in which the Ionic style was used. Rebuilt in permanent materials, it now houses the Museum of Science and Industry.

autumn almost every farming center holds an exhibition of its produce, live stock, and household arts, with manufacturers' booths exhibiting the latest types of machinery for farm and home. Church and community fairs are common in the United States and the *kermess*, which originated as a religious observance centuries ago in Flanders, is a popular form of bazaar in some regions for charitable purposes.

A recent development has been the rise of exhibitions devoted to single industries, such as radio, furniture, automobile, and motor boat shows, and exhibits of home building materials and household conveniences of many kinds.

Several recent European fairs have established a new manner of exhibition. The fair in Wembley Park, near London, in 1924, was devoted exclusively to exhibiting the products of the British Empire. The cost of the Empire fair was \$200,000,000, six times that of the Chicago Columbian Exposition of 1893. France held an exhibition of modern decorative and industrial arts in 1925 to emphasize for the first time the importance of the arts in commerce and industry. Again in 1931, France sponsored another large exposition,

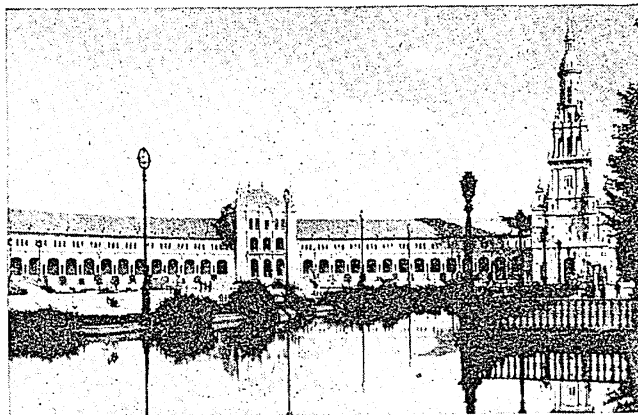
Spain, in 1929. The same year Spain held another exposition at Barcelona, at which exhibits from all nations were shown.

In Canada the Great National Exposition, at which American merchants and manufacturers exhibit, has held annual displays at Toronto for more than 50 years.

The extraordinary success of the colorful Century of Progress Exposition at Chicago in 1933-34 (see Chicago) gave new impetus to international exhibitions in the United States. San Diego in 1935-36 celebrated four centuries of progress in the West

with the California-Pacific International Exposition. Cleveland honored its centenary with a Great Lakes Exposition in 1936-37. Dallas celebrated Texas' 100 years of independence from Mexico with the Centennial Central Exposition in 1936-37. Both New York City and San Francisco held international expositions in 1939 and 1940. San Francisco built an island in the bay for its

A SPANISH EXPOSITION BUILDING



Permanent buildings in the best style of Spanish and Moorish architecture were erected for the Ibero-American Exposition, held at Seville, Spain, in 1929. This is the Plaza de España, showing part of the main building, in Maria Luisa Park.

project, the Golden Gate International Exposition. New York located its World's Fair on a site in Flushing in the borough of Queens, accessible by both the East River and the great new Triborough Bridge.

LITTLE TALKS ON GREAT THINGS *by Arthur Mee*

FAITH

PESSIMISM is despair; the pessimist is the man who looks out on the world without hope, seeing gloom in everything, and believing the worst.

The world has always laughed at the dreamers who make things come true. In every age there are those who dream and those who laugh, and when the age has passed away another age comes on; and always it is true that when the world looks back it puts up statues to those who dreamed and laughs at those who laughed.

Think of the men who would not believe, and the things they would not believe. The corridors of the centuries ring with the mockery of those men who were deaf and blind to things beyond their little understandings.

They were there, these unbelieving people, when poor Richard Trevithick, in 1802, was driving his strange old smoking, sparking steam carriage through the country lanes at midnight; they laughed to scorn this man who had the beginning of railways and automobiles in his brain. And then there were the clever men who knew so much better than George Stephenson. They went in a great procession into the witness-box and proved how his locomotive would burst its boiler and blow the passengers to bits; how the sparks would burn the houses down, and how the countryside would be turned into a wilderness by this knave who talked of riding in trains.

Even if all these things did not happen, those clever people said, it was quite impossible that the wheels of a train would grip the rails; they were as sure about it as the ex-president of the Royal Society was sure that steamships were impossible. Nobody believed in Robert Fulton, when, during a prolonged residence in Europe, he proposed to build his first steamboat; if they had, the whole history of our times would have been vastly changed.



Not even science has always had faith in itself. There was a great day at the British Association when a young man from Manchester began to talk about the power of heat, but the scientists were bored, and the president called him to order. Today all the world honors that young man and knows that he was announcing one of the greatest discoveries in modern science. He was James Joule.

If science has at times been so hopelessly wrong, we need not be surprised at the stupid things the politicians say and do. You will find in the records of the British Parliament that a prime minister once said of the Suez Canal: "It shall

not be made, it cannot be made, but if it were made it would bring war between England and France." But all great reforms have come in spite of governments.

Nobody believed in flying. Professor Langley, of the Smithsonian Institution, the man who first proved that flying was possible, was laughed at and jeered at until he gave up his work, a broken man. Wherever we look, whatever we think of, the pessimist is there. The truth is that the world is too wonderful to believe. It is hard to believe that man, like a speck on the earth, has conquered the beast and magnified his senses so that his eyes can see a thousand times farther than Nature made them to see, his ears can hear a thousand times farther than Nature made them to hear, his voice can carry across the earth.

Life is hard to believe; a beehive is hard to believe. A seed is hard to believe, and all the beauty that grows out of it. There are many things beyond our understanding, but we know the way we came, we know the way we go, and the rock on which we stand is not to be laughed into dust. Let them laugh who will, but as for us, let us believe. Man, who has come so far, will march to victories greater yet.

FALCONRY. Winging high over an open field at dusk a heron is returning to its nest. In its long sharp beak is a small fish. Crouched in a thicket a falconer (hunter) is waiting silently. Deftly he unhoods the gyrfalcon which is perched on his gauntleted hand, whistles softly, and releases it. With lightning speed the falcon flies at the heron. The heron flutters its wings, drops the fish and soars higher and higher into the air. The falcon, flying in wider spirals, but at greater speed, climbs above the heron, then swoops downward like a flash of winged lightning. Within a few feet of its quarry it closes back its wings and darts on the heron, striking it with a fierce blow. The two then come to earth together at a tremendous speed and the falconer, rushing forward, seizes the heron by the neck.

This sport in the Middle Ages was the favorite pastime of the nobility. The sport was revived in the 18th century, but shooting became more popular, and falconry never regained its old prominence. It continued, however, to be practised without interruption in various parts of Asia and Africa, and has in late years been revived in England and the United States. The sport appears to have been known in China as early as 2000 B.C. Other ancient records of falconry are found in Japan, India, Arabia, Persia, Syria, and northern Africa.

Training Birds for Hawking

Training birds for hawking is a delicate art in itself. The falcon may be taken from the nest before it has learned to fly, when it is called an *eyess* or *eyas*, or it may be trapped full-grown, and tamed. It is then called a *haggard* or *blue hawk*. A hood is used in taming to cover the falcon's head and a *brail*, or strip of leather, is slipped over the wings to prevent fluttering. *Jesses*, or strips of light leather with bells attached, are fitted to the legs. A leash is fastened to the jesses. The bird is kept in a dark room and through feeding from the fist is gradually accustomed to the hand and voice of the trainer.

Two classes of birds are used in hawking—long-winged hawks or true falcons, and short-winged hawks. The true falcons include the gyrfalcon, peregrine, hobby, merlin, and the kestrel. The short-winged hawks include the goshawk, sparrow hawk, kite, buzzard, and harrier. The sport has a language all its own. The prey is called the *quarry*. Striking the quarry in mid-air and clinging to it is *baiting*, when game is large, or *trussing*, when it is small. The *lure*, frequently a stuffed body of the quarry, is used to win the bird back after it has been freed. Fighting is *crabbing*, and flying away with the quarry is *carrying*.

FALKLAND ISLANDS. Three hundred miles east of Magellan Strait, near the tip of South America, lie the Falkland Islands—low, rocky, treeless, swept by fierce winds, and pelted three-fourths of the year by cold drizzling rains. The full force of the South Atlantic Ocean hammers their ragged coast line, and above the roaring breakers clouds of sea-birds whirl and scream.

Of the hundred or more islands in the group, only two are important—East Falkland and West Falkland, the former 95 miles long and 40 miles wide, the latter slightly smaller. On the eastern island is the

town of Stanley, headquarters for Great Britain's southernmost colony, which comprises the Falklands and part of the Antarctic region, including the whaling colony of South Georgia, the South Shetlands, the South Orkneys, the Sandwich group, and Graham Land (for map, see Antarctic Continent).

Sheep raising is the chief industry of the islanders, most of whom are Scottish. Wool, mutton, and other sheep products are exported. Shipyards do a good business refitting vessels which have been battered by storms off Cape Horn. Monthly steamers call from England, and there is a wireless station at Stanley. Population, about 3,000.

Discovered by the British in 1592, the Falklands were occupied in succession by the French, the Spaniards, and the Argentines. But England claimed prior ownership and in 1833 set up a crown colony there, despite Argentina's protests, which still continue. Their nearness to the southern trade route through the Strait of Magellan makes the islands strategically valuable. On Dec. 8, 1914, a German naval squadron under Admiral von Spee was destroyed near the Falklands by a British man-of-war.

FALL RIVER, MASS. Ever since its first cotton mill was built in 1811, Fall River has been a noted center for the manufacture of cotton goods. It was one of the country's foremost cities in cotton spinning and weaving until Southern mills took the lead away from those of New England.

Fall River is 49 miles south of Boston, situated on a granite cliff that rises abruptly where the Taunton River empties into Mount Hope Bay. The bay forms an excellent harbor for ocean-going ships, and there is an active coastwise trade. Power for manufacturing is furnished by the Quequechan River, which rushes down from the Watuppa Lakes. "Quequechan," the Indian word for falling water, gave Fall River its name.

The abundant water power and the fine harbor, combined with the moist climate, made Fall River an ideal location for the spinning and weaving of cotton. Mills sprang up all along the banks of the Quequechan, and the industry grew to large proportions. As cotton manufacturing moved south, however, many mills were abandoned. So seriously was the city's prosperity affected that in 1931 the state of Massachusetts had to come to the rescue and take temporary control of municipal finances.

The manufacture of all kinds of cotton goods is still the principal industry, but new and diversified manufactures are being encouraged. The city produces rayon and silk fabrics, rope and twine, paper boxes, ships, paint and varnish, clothing, hats, and jewelry. There are also brass and iron foundries, cotton-printing and cloth-bleaching plants, and oil refineries. Granite quarries furnish material for many of the buildings.

Fall River was settled in the 17th century as part of a grant of land obtained from Chief Massasoit. It became a town in 1803 and was incorporated as a city in 1854. Fire swept through the heart of the city in 1843 and again in 1928. After the 1928 fire a city plan was adopted and streets were widened. A city manager heads the government. More than one-fourth of the population is foreign-born. Population (1940 census), 115,428.

The STRONGEST TIES *that Bind Human* SOCIETY

FAMILY AND TRIBAL LIFE. A famous novelist wrote a story in which he pictured the first human beings living in small groups. At the head was a powerful male. With him were his wives, his daughters, and his younger sons. But when these boys grew up they were driven away by the father. If they were sly or strong enough, they began to steal women from other groups, and thus built up bands of their own. In this story early man differed little from the animals which he hunted.

How the Clan Developed

Other pictures of life in the earliest times have been given us. Some writers believe that at first there was no family at all. Young children remained with their mothers until old enough to take care of themselves, then became independent members of the human herd. As man began to fashion tools, the idea of property developed. Children living with their mothers would take possession of her belongings when she died. They would come to know her sisters and associates and with them would form a group, the members of which would consider themselves related. According to these writers, if a man from outside sought a mate in this group he would be accepted only as a visitor, and his children would remain with the mother. Since they would have no contacts with the father's family, they would not think of them as relatives, and hence would not claim a share in their property. Thus, in time, a group would be established in which the children would inherit property through their mother and would consider all the members of her group as relatives. Such a group is called a *clan* (a Gaelic word allied to the Latin *plania*, a sprout).

The upholders of this theory believe that at one time the women were so important that they were actually the heads or rulers of the clans. Such a society, in which women rule, is called a *matriarchate*, a term derived by combining two Greek words meaning "mother" and "rule."

"Mother Rule" Gives Way to "Father Rule"

With the increase of population and wealth, especially after a few animals were domesticated, the man began to be more important and mother rule slowly changed to father rule, or *patriarchate*. As protector of his group and of his flocks, the man became a warrior, while household duties and the raising of crops fell to the woman. If the man had considerable property, he needed additional women to manage the camp; so he married more. The marriage of a man to more than one woman is known as *polygamy* or *polygyny*; polygamy really means "much married"; polygyny means "many women." Sometimes warfare between the groups, or the loss of a band of hunters, would result in a shortage of men, which also might lead to polygamy.

There are many other theories concerning the development of the family and of society, but these exam-

ples will indicate that the form of family organization has not always been the same as it is with us today.

In recent years the anthropologists have studied tribes in all parts of the world; they have excavated ancient cities and burial places, and have furnished us with a wealth of information concerning the customs of early man as well as the more primitive peoples now living in the world (see Archeology). Let us see what types of families and social groupings researches have discovered.

Monogamy and Polygamy

It is generally agreed that the most common form of marriage is *monogamy*, the marriage of one man and one woman. We are accustomed to think of this as the highest and latest type, since it is practised by the most advanced peoples of today; but it is also practised by the pigmies of the Philippines, who are one of the most primitive peoples now living. It is likewise the usual form of marriage found among the American Indians, the Malays, and many of the peoples of Asia.

Next in importance is polygamy. In Old Testament times this was the common practise of the Jewish people, but they have now generally abandoned it for monogamy. However, the closely related Arabs have retained the custom of having several wives. Practically all Arabs are Mohammedans, and each member of that faith is allowed four wives.

Throughout the greater part of Africa, wives are considered as part of a man's wealth. He pays a price for a woman and she then becomes his possession. If he has many wives, they cultivate his land, care for his animals, and look after the household. The importance of a native chief may be measured by the number of women in his family.

Polygamy is recognized in India, China, and many portions of the Orient, but usually is restricted to the wealthier classes. It was practised also by some American Indian tribes, and to a slight extent by the Mormons until it was prohibited by the laws of the United States. Closely related to polygamy is a system known as *concubinage*, in which a man possesses many women who are not considered as wives and whose children usually do not share in the property. This custom formerly was common among the Semitic peoples, was endorsed by Mohammed, and is still found in parts of the Orient.

Where the Wife Heads the Household

The possession of two or more husbands by one woman, called *polyandry* (from the Greek words for "many" and "men") is less common than either of the two forms of marriage already discussed, but is found in widely separated areas, notably in Tibet, in Southern India, among the pigmies of Palawan, an island of the Philippines, and in some Eskimo groups. It does not occur among the more primitive peoples. In polyandry the wife usually maintains the family household, and her husbands take turns living

in her home. The wife designates which husband is to be considered "father" of each child. Each child receives support from its appointed father but does not inherit his property. Probably there are various reasons for the existence of polyandry, but the situation among the Eskimos may help to explain the custom elsewhere.

In ordinary years there is sufficient food in the far northern regions, but sometimes the hunters fail to secure sufficient game, and famine follows. It then becomes necessary to get rid of the weaker and less useful members of the group if the others are to survive. Under such conditions, elderly persons and young children are sometimes put to death. Since men are the hunters and chief providers, they are considered more valuable than women; hence female children are done away with before the male. This may result in such a shortage of women that if all the men are to be married some of them must share the same wife. Once the custom was established, it might be continued long after the cause for it had been removed.

Eskimo life also offers one explanation for polygamy. In securing game it is often necessary for the men of a settlement to go far out on the ice. Sometimes the ice breaks up when a storm arises, and carries the men out to sea. The loss of the men leaves a surplus of women, with the result that some men possess more than one wife.

Facts of Primitive Life

The study of archeology and of existing groups of primitive people throws much light on the probable development of family and community life. Apparently man was, first of all, a hunter. He lived on the game he could kill, and the wild fruits and plants he could gather. But hunters must be often on the move. Even if game is plentiful, it is quickly exhausted or driven away if hunted by a large band. Wild fruits and roots may furnish food to a group for a short time, but seldom are conditions such that many people can remain together for more than a few days if they are dependent on either game or wild products.

The cavemen of Europe were hunters. Near the entrances to their caves they built fires to which they

carried the animals they killed. After eating the flesh they threw the bones to one side where, in time, they became covered with ashes from the fires, along with implements and other camp refuse. Fortunately for our study, they buried their dead together with their crude belongings. From their old camp sites and burials we have good evidence that the primitive people of Europe lived in small groups, probably families. We judge this partly from finding about an equal proportion of men and women in the graves.

Customs of the Eskimos

If we seek a present-day people living under much the same conditions, we are led to the Eskimos. Like the cavemen of Europe, they live under Arctic conditions. They have no agriculture and no domestic animals other than the dog. The climate is too rigorous to permit the growth of roots and berries, and hence the people are dependent entirely on hunting and fishing. At rare intervals, when game is plentiful, a large band may gather for a few days to feast and dance, but ordinarily they live in small semi-nomadic groups. Such a group ordinarily consists of father and mother, grown sons and daughters, their families, and a few others. This

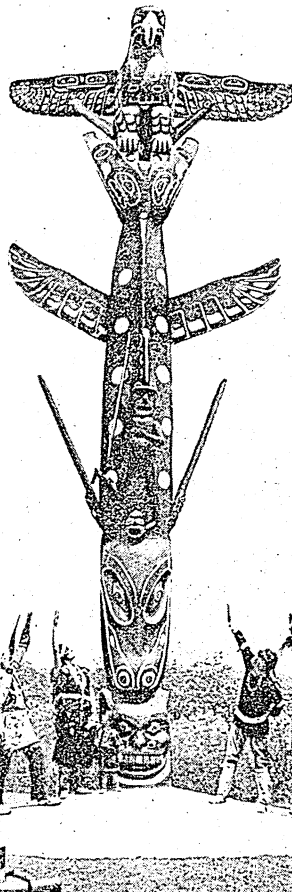
unit hunts together, and its members assist one another. If one has food, all share it. It would be unthinkable to the Eskimo for one to have a surplus, while another was in want. In such a group there is no development of chieftainship. An old man has some authority because of age and his better knowledge of the

customs of the people, but if his decisions are not satisfactory, the younger men may take their families and make another camp.

The customs of the ancestors are the laws of such a people, and both are closely related to religion. In fact, in primitive society it is difficult to separate religion, law, and custom. If one fails to conform to established custom he shows disrespect for the ancestors, he violates time-honored usages, and he outrages public opinion.

If we look to other primitive hunting groups, we find much the same condition. The pigmies of Malaysia, and the nomadic hunting Indians, usually live in

A "FAMILY" TREE



A unique feature of religious and social life among primitive peoples is the Totem Pole. Adorned with symbolic figures of animals or plants, it represents the communal life of the clan or the individual events of one family. "Kwa Ma Rolas," shown here, was carved by the Haida Indians of Alaska over a hundred years ago. It now stands at the north entrance to Lincoln Park, Chicago.

small bands. In them we find family units, but no trace of clan, no development of chieftainship, no state or tribal organization, no law beyond custom. They do have a religion but it is exceedingly simple and has not given rise to a priestly class.

If now we refer back to the theories mentioned in the early portion of this article and compare them with the facts just outlined, we find there is little in primitive society or in the life of the caveman to justify the belief that human beings once lived together in herds, or that human society was divided up into small groups made up of a fierce old male, his wives, and young children.

The Hunting Bands of the Plains

Even among hunters and herders, social groupings occur. Among the Indians of the Plains, a considerable amount of coöperation was needed to hunt the buffalo. Here we often find semi-independent bands which unite for warfare, hunting, and great ceremonies. In such a band there usually is an outstanding man who assumes leadership, but his actual authority is slight, and matters of importance are decided by a council of the older men. Here we find the *shaman*, or "medicine man," curing the sick, compelling the game to be plentiful, and performing other acts closely related to magic. Here, also, we find elaborate ceremonies, such as the sun dance, which require the knowledge of ritual, of songs and dances. Sometimes the leaders of the ceremonies are the shamans, but frequently they are other individuals who begin to take on the duties of a priesthood.

When man came to possess domestic animals his life was greatly modified. He then had a steady food supply, but his freedom of movement was greatly restricted. He had to follow his herds and flocks to favorable feeding grounds near water. He had something to defend against wild beasts and human marauders. But herding without agriculture meant that the food supply of a region would be quickly exhausted, and hence the herds must be small. The need of protection against robbers usually resulted in some sort of central organization under a chieftain, but it also led to a high development of individual courage and love of freedom. City and village life were, of course, impossible to a pastoral people.

Nomadic Herders of North Africa and Arabia

Perhaps the Bedouins of North Africa and Arabia are the best examples of this type of social grouping. Here we find small bands made up of closely related individuals who owe allegiance to a head man or sheik. In normal years the bands have rather definite ranges, but in times of drouth they migrate great distances into the lands of their neighbors. Such migrations usually result in open hostility, and even in times of plenty raids and counter-raids are made on the herds of other sheiks.

The camps of the sheiks consist of one or more large tents often furnished quite elaborately. A considerable number of people make up such a household and the food supply is plentiful. In such a society

polygamy is common, and a camp often consists of a father, his wives, sons, daughters-in-law, and younger children. In the immediate family the father is ruler, even though he recognizes the overlordship of another. This is like the patriarchal family of Old Testament times.

In Europe and Asia the line of development appears to have been from a hunting to a pastoral life, but in prehistoric America there were no cattle, horses, or sheep until after the coming of the Spaniards, and hence, no pastoral stage. Since the introduction of domestic animals, certain groups, like the Navajo, have become semi-nomadic herdsmen, and today lead a life in many respects like that just described.

Hunting and herding make for individual freedom and initiative, but both forms of life are against the formation of centralized governments and the coöperative efforts of large groups. No great states ever have been developed by people dependent solely on hunting or herding.

Effects of Agriculture

When agriculture was discovered, the true foundation for civilization was laid. Domestic plants made it possible for man to store up a surplus of food. It allowed for a certain amount of leisure and led to much coöperative effort. When animal husbandry was added, the way was open for rapid advance.

With agriculture, man's freedom of movement is greatly restricted. From the time the seeds are sown until harvest the plants need attention, and once the crop is gathered, it must be stored and marketed. If a dry season occurs, the herdsman can move his flocks to more favorable spots, but the farmer must remain with the land. He thus comes to feel his dependence on supernatural powers to a much greater extent than the hunter or herdsman. In times of drouth, he seeks to persuade the spirits to send the needed rain. To insure good crops, he holds ceremonies at times of planting, such as the corn dance of some of the Pueblo Indians; and if the harvest is bountiful he makes a thanksgiving offering.

This interest in the spirit world leads toward the development of a priesthood, the members of which often become the actual rulers of the state. Such a condition, which is known as a *theocracy*, has been found in many parts of the world. It existed in Egypt, in Yucatan, and among the Aztecs at the time of the coming of the Spaniards.

Rule of the Old Men

But other developments often took place in agricultural societies which led to very different results. For instance, most of the pagan tribes of the Philippines live by agriculture. They terrace the mountain-sides to make a place for their fields and carry water to them by means of flumes and ditches. This activity requires group effort, and leads to the formation of villages. A village may be friendly with its near neighbors but at warfare with all the others. Headhunting and warfare are common. These Philippine tribes have priests or mediums, but these do

not form a governing class. As a rule, one of the older men is chosen as the head man, and he decides all disputes according to the customs of his ancestors. If he is in doubt, or if a new question arises, he calls in the other old men, and they decide what shall be done. A government in which the rule rests with a few persons is known as an *oligarchy*.

The theory, already mentioned, that the clan and the matriarchate are the first steps out of unorganized society, does not seem to be supported by the evidence. Except in Australia, the clan is rarely found among the more primitive peoples. In the Far East, the lowly pigmies and the most primitive Malays have neither clan nor trace of matriarchal rule, but the Menangkabau of central Sumatra, the most advanced of the Malays, have both. In America, the less advanced of the tribes of the Arctic, the Plateau area, and California lack both clan and maternal rule. But the Iroquois, the Pueblo Indians, and the Northwest Coast Indians, with their high cultures, have a strong clan system.

Totems and Totemism

The clan consists of a number of people who consider themselves related, either by descent from some mythical animal or from an ancestor who had unusual experiences with such a being. As a result of this relationship the clan members have a right to use the representation of the animal as their badge or crest; they are known by its name; and they have the sole privilege of telling the stories, singing the songs, and enacting the ceremonies supposed to have been handed down by the ancestor. These rights are inherited through the female line. This system is *totemism*, and the animal or its symbol is a totem.

Everyone born into a clan retains his or her membership through life. Marriage is prohibited inside the clan, and a young man seeks his bride from another group. But the children remain in their mother's clan. Property in land or houses belongs to the group, but personal belongings such as garments, ornaments, and weapons are recognized.

The Phratry and the Tribe

Several clans with interests in common combine to form a group known as a *phratry* (from the Greek *phrater*, meaning brother), and two or more of these

make up the tribe. As a rule, each family is represented in the council of the clan; each clan selects a member to represent it in the phratry; and each phratry is represented in the tribal council. These representatives have generally been known as chiefs, and their power has been greatly magnified in stories of American Indian life. The real authority rests in the tribal council. Early Europeans in trying to

describe the life of the Indians often wrote of "princes" and "princesses," but nowhere in North America was there any social organization which justifies such a term.

Probably the highest development of political life north of Mexico was found among the Iroquois. Their social organization, up to the tribe, was much like that just described, but they had also developed an offensive and defensive league in which, in theory at least, every family was

represented. It had no single executive officer, but possessed two war chiefs, each of whom held the veto power against the other. The real authority rested in an elected council.

An organization very much like that of the Iroquois is found among the Menangkabau of central Sumatra. The family consists of an elder woman, her sisters, daughters, and their children. Sons also belong to the family, but after maturity seldom reside in the family house. Each family has its house and fields, and usually a brother of the head woman acts as manager and counsellor. Men who marry into this unit come to the house as visitors, but they have no rights or authority there, and their children are under the control of the women and the mother's brother.

Several houses make up a clan and several clans form the phratry. Each family has its council, and one of its members represents it in the council of the clan. The clans, in turn, select members for the governing group of the phratry.

The "Gens" Distinguished from the "Clan"

We have used the term "clan" to refer to the unit in which inheritance and descent are in the female line. In many societies we find a similar organization, but with male descent. Strictly speaking, this is known as a "gens," but in popular writing both are known as clans. The Scottish clan was in reality a gens. The idea of clan and phratry is very widespread, and

DRUMS THUD AND FEET STAMP IN THE CORN DANCE



In primitive societies magical ceremonies to propitiate the gods and insure bountiful harvests are common. Such ceremonies are still practised among the Indian tribes of the American Southwest. Here we see an Indian artist's portrayal of the Corn Dance as practised by the Cochito Pueblo in New Mexico.

earlier writers tended to consider it as a universal first improvement upon "common herd" ways of living. Other lines of development now are recognized.

Conservatism and Change

Isolated groups and peoples tend to remain conservative and obedient to tribal custom. Many societies train children for years in customs and require them to pass a severe initiation into grown-up life. In such groups, those who do not conform to custom are outcasts and may even be put to death.

Such ways strengthen clans and tribes, but block change and advance. But when trade, war, or other causes force groups into contact with one another, conservatism breaks down. Changes and advances become not only possible, but necessary to survival. The need for rapid action to meet emergency gives rise to a need for leaders; and from this need come chieftains, kings, rulers, and organized government. (See also Government; Marriage.)

FARADAY, MICHAEL (1791-1867). The great scientist Sir Humphry Davy was once asked what he considered his greatest discovery. "Michael Faraday," was his answer.

Michael Faraday was the son of a London blacksmith. At 13 he was apprenticed to a bookbinder. He read eagerly any scientific books that he could find in the shop, and so attracted the attention of one of the customers. This man gave him tickets for lectures by Sir Humphry Davy. Faraday made careful notes of the lectures and sent them to Davy, asking for a position. Impressed by the boy's zeal, the great scientist took him into his laboratory as an assistant. From this beginning Faraday went on to become one of the greatest experimental scientists of all time. (For portrait and further details, see E-232.)

Faraday made several notable contributions to chemistry, especially in liquefying gases by use of pressure, and in discovering benzene in 1825. His laws of electrolysis, formulated in 1834, linked chemistry and electricity (see Electrochemistry).

His greatest achievement was the discovery of electromagnetic induction. He found in 1831 that moving a magnet rapidly near a coil of wire produces an electric current. A lady who saw him perform this experiment during a lecture asked, "But, Professor Faraday, even if the effect you explained is obtained, what is the use of it?" "Madam," replied Faraday, "will you tell me the use of a new-born child?" This child of Faraday's brain grew, in the course of time, into the electric generator, which is the basis of our vast modern electrical industry.

Faraday's discoveries and theories formed the foundation of Clerk-Maxwell's "brilliant guess" that tied electricity, magnetism, and light together, and led to the invention of radio (see Radiation).

FARM CREDIT. Every spring farmers need money for seed, young animals, and other expenses. Usually they obtain the money through a *production loan*, and repay the loan when the crop is sold. When buying a farm, farmers usually pay part of the pur-

chase price in cash and give a mortgage on the farm, running for several years, to secure payment of the balance. Farmers also need loans to carry themselves through years when crops are bad or when prices are too low to repay production expenses.

Such loans constitute *long-term credit*, running for at least a growing season and with prospect of prompt payment subject to the chance of crop failure, falling market prices, and other farming hazards. Merchants and manufacturers, on the other hand, operating on a faster "turnover," get loans from banks and other private lenders for short terms of not over 90 days. Since the risks on such loans are less, the rates are lower. Hence the farmer in the past has had to pay high interest rates to get the long-term credit he needed. In 1916 the government created a system of Federal Farm Loan banks, and in 1929 it added a Federal Farm Board, to extend cheaper credit to farmers. By an executive order of March 27, 1933, President Roosevelt combined these organizations into a Farm Credit Administration. The Agricultural Adjustment Acts approved May 12, 1933, and Feb. 16, 1938, made this organization permanent.

Under these laws, farm credit is extended largely through local coöperative associations. The associations discount the loans with various units of the Farm Credit Administration. Farm Loan Banks take first mortgages up to 50 per cent of the appraised value of a farm. A Land Bank commissioner takes second mortgages up to 25 per cent more of the total value. Production Credit Associations make loans to finance operations for a season or a year. Federal Intermediate Credit Banks and Banks for Coöperatives lend money to coöperative credit organizations and local associations. The Federal Farm Mortgage Corporation issues government-guaranteed bonds to provide capital for the system, and borrowers must invest 5 per cent of their loans in the stock of their local associations until they repay their loans.

Another source of credit is *crop loans*. These are made upon cotton, corn, wheat, rice, and tobacco, which are held in storage until the loan is repaid. A law signed May 26, 1941, authorized loans up to 85 per cent of the *parity value*, which fixes prices at the values of 1909-14 (see Agriculture).

FARRAGUT, DAVID GLASGOW (1801-1870). The ranks of vice-admiral, rear-admiral, and admiral of the United States Navy were created successively to reward the services and acknowledge the genius of this great American naval hero. His captures of New Orleans and Mobile find parallels only in Nelson's victories of Copenhagen, the Nile, and Trafalgar; for battles between modern naval vessels are not comparable to the fighting of Farragut's day.

Farragut was born on July 5, 1801, in a pioneer cabin near Knoxville, Tenn., of a Spanish-descended father and a Scottish mother. His father's friendship with Commodore Porter brought the boy an appointment as midshipman before his tenth birthday. The United States Naval Academy was not established

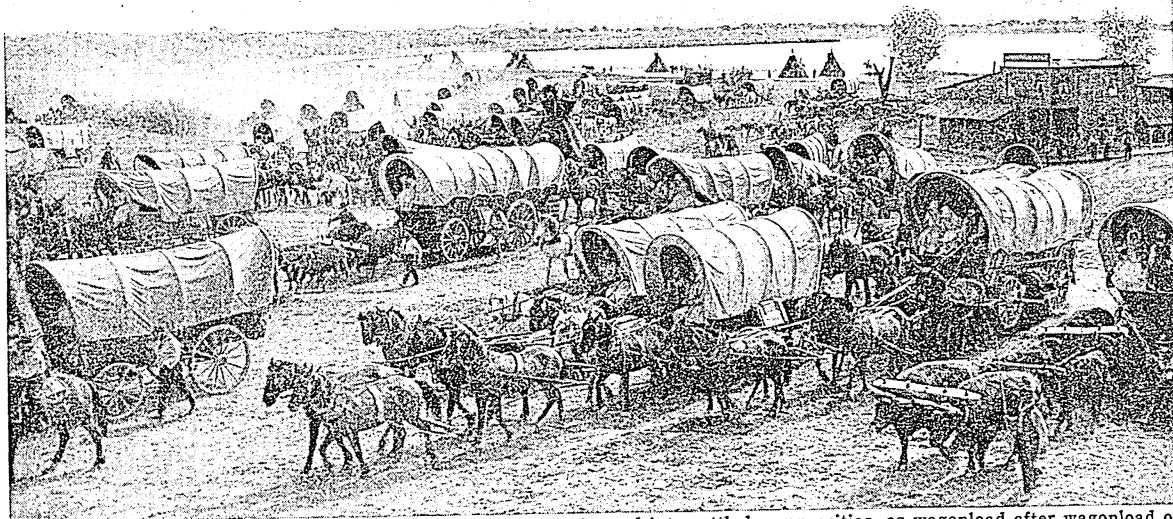
until 1845, so cadets were educated and trained at sea. In the War of 1812 Midshipman Farragut sailed with the *Essex* on her famous cruise to the South Pacific, took a prize ship into Santiago, Chile, at the age of 12, and conducted himself with coolness and courage in the terrific battle with two British frigates in which the *Essex* was sunk. Forty-five years of routine duty followed, which included establishing the naval station at Mare Island, San Francisco.

When the Civil War came, Captain Farragut was in his 60th year. Although of southern birth, with a Virginian wife and home, he decided that his allegiance belonged to the Union. He was given command of the western Gulf blockading squadron with a superb fleet of heavy ships, gunboats, and mortar boats, and ordered to open the mouth of the Mississippi by taking New Orleans. The way up the river was defended by two forts, between which stretched a heavy iron chain. Farragut burst the chain, ran his fleet past the guns of the forts, evaded a fire-ship, sank the defense fleet, and captured New Orleans.

For 16 months more he saw exciting service on the Mississippi, aiding materially in the taking of Vicksburg. So continuously was he under fire that he won the nickname of "Old Salamander." Then he was ordered to take Mobile, the last stronghold of the Confederates on the Gulf. The entrance to the bay was protected by Forts Gaines and Morgan, and the channel was filled with torpedoes. Nevertheless, within three hours after the first gun was fired in Farragut's attack, the Confederate flag was hauled down (Aug. 5, 1864). It was at the crisis of this battle, when the Union fleet was on the verge of defeat, that he uttered his famous saying: "Damn the torpedoes! Go ahead!"

This was his last active service. For three years he had served the Union at an age when most men think of retiring. He now asked to be relieved from active duty, and settled in New York City. Great celebrations were held in his honor, and for the six remaining years of his life he enjoyed honors such as have been accorded to few Americans.

The LAST FRONTIER—America's Greatest ROMANCE



Within 40 years the vast wilderness of the Far West was transformed into settled communities, as wagonload after wagonload of sturdy pioneers left the security of homes and friends to seek new lands. History tells of the blind faith and indomitable courage with which these American adventurers met the hardships and dangers of the trail. The story has been realistically told again in the motion picture, 'The Big Trail', from which the above scene was taken.

FAR WEST. More than 100 years ago the American novelist, James Fenimore Cooper, wrote his 'Leatherstocking Tales', and the boys and girls of his day thrilled with the adventures chronicled in 'Deerslayer', 'The Last of the Mohicans', and the other stories of the series. He was writing about the Far West, and the life of Indians, hunters, and pioneers; and he laid his scene in central New York, for that was where the West then began. After half a century, Mark Twain wrote 'Roughing It' and Bret Harte wrote 'The Luck of Roaring Camp'. They too described the West, and the men and women who wrestled with it; but they found it in the valleys of the

Rocky Mountains and in the mining camps of the gold fields. They told romantic stories, which Americans loved to read and which readers in Europe welcomed, for it seemed to them that this West was the most picturesque thing in all America.

In 1887, one who had lived his life along the border took a visible sample of it to England where it was the great success of an imperial exposition. This was "Buffalo Bill" (Col. William F. Cody) whose Wild West Show had made its first appearance in 1883, and was to make its greatest triumph in 1893 at the World's Columbian Exposition in Chicago. But the Far West that Buffalo Bill knew as express rider,

scout, soldier, hunter, and showman was gone by 1893, never to return. It remains one of the pictures from the American past, always full of thrills and of real importance.

At the close of the American Revolution, after independence had been won, the United States was a seaboard nation, with the Mississippi River as a western boundary. Pioneer settlements were spotted over the country from Pittsburgh to St. Louis; the rivers carried the canoes of the prospectors and the flatboats of the settlers into the wilderness; the cabins of the frontiersmen appeared in the clearings in the forest, and the clearings grew and spread until broad and fertile fields became common everywhere. There was so much work to be done making new states east of the Mississippi that there were few who worried over what lay beyond.

The Beginnings of the West

Thomas Jefferson was one of the few who worried. Immensely curious, he wanted to know just where the Rocky Mountains were, for none of the maps were accurate. He knew that the vast Missouri emptied into the Mississippi from the west, just above the mouth of the Ohio; but no one could tell him whence it came. He was projecting exploring parties to find the answers to these questions, when in 1803 it unexpectedly became possible to buy the whole of Louisiana, as the farther West was called, from France. He bought it quickly, and at once sent Meriwether Lewis and William Clark upon their way up the Missouri River and down the Columbia, until they reached the Pacific Ocean beyond the Rocky Mountains. They brought back an account of the Far West that lay beyond the West that Jefferson knew. And until the century was nearly over, this Far West was a romantic piece of stubborn nature that would not respond to the same treatment that conquered the Middle West and the Eastern settlements. It was tamed for human use only when the railroad was built across it, the windmill brought water to its treeless slopes, the wire fence defined property rights on its otherwise almost boundless ranges.

Lewis and Clark returned from their explorations in 1806, and there were already under way other efforts to find out what it was that Jefferson had bought. In the previous winter, a young lieutenant in the army, Zebulon Montgomery Pike, had been sent up the Mississippi River from headquarters at St. Louis to ascertain the source of the great river. He did not find the real source, which is in a district of lakes and swamps, for the whole region was under thick ice and heavy snow, but he brought home much information about the country above the mouth of the St. Peter's, or Minnesota River. In the summer of 1806 Pike was sent out again, this time to find the sources of the Red River and the Arkansas. Again he found neither, but he saw the great peak which has come to be known as Pikes Peak, and he visited the park where the Rio Grande rises in southern Colorado. Here he was arrested by Spanish soldiers, for he was

trespassing on their territory; nothing west of the Rio Grande could upon any claim be treated as a part of Louisiana. He was escorted—half prisoner, half guest—through New Mexico, the northern provinces of Mexico, and Texas; and in 1807 he was returned unharmed to the American army post at Natchitoches. His book, published a little later, fired the ambition of traders on the Missouri border to visit Santa Fe and capture the markets of the Spanish settlers.

The general dimensions of the Far West were now known, but there was no rush of settlers to occupy it. Louisiana became a state in 1812, Missouri in 1821; and three more states along the Mississippi River, Arkansas (1836), Iowa (1846), and Minnesota (1858), came in due time. West of Missouri there was no serious move for a new state until after 1850. All this time the United States accepted the verdict of the early explorers, and of Stephen H. Long, who crossed the plains in 1819-20. Their opinion was that after the first row of states along the Mississippi River there was little chance of further penetration for the farmers of the West. The country was nearly treeless, and too dry to raise a crop. In spots it was rocky and mountainous; and elsewhere there were sand and sagebrush that constituted real desert. As the Great American Desert it was featured in the school books. It teemed with wild game, with the buffalo herd that grazed its way up the plains each spring, and down again each autumn, and with other animals whose numbers aroused the excitement of all who visited the region. There were Indians, too, who lived on the flanks of the herds, with fleet ponies descended from the animals the Spanish explorers had turned loose or lost. The farming frontier developed east of the Mississippi and in the first tier of states west of it, but the Far West was left to native Indians and wild game until long after the great migration had peopled the Ohio Valley.

Missionaries and Fur Traders

Long before American explorers drew their picture of the Far West the country had been known to the French and Spanish. Missionary explorers and soldiers had visited it many times, and traders had come, tempted by the profits of the fur trade. From New Orleans they had worked up the river to St. Louis; and from St. Louis they reached out towards the Rocky Mountains, inducing the Indians to bring in furs, and sending out trappers to collect them. They had come, too, from Quebec and Montreal; and from the shores of Hudson Bay. Their runners, who scoured the plains and searched out the mountain holes where the animals flocked, knew every detail of the land long before the surveyor arrived to map it.

When it became part of the United States, Congress tried to drive out the foreign trappers, particularly those of the Hudson's Bay Company, and to protect the traffic for American advantage. John Jacob Astor, a New York merchant, took a lead in organizing American fur companies. Stockaded posts were built for agency houses, where trade with Indians was

carried on. Each year the goods for the Indians were sent to the posts: blankets, guns, powder, tools, needles, beads, and all the trinkets the Indian lacked and wanted. And each year the western tribes, after the winter hunt, journeyed to the posts to trade their furs. Out of the posts, white traders and half-breeds who were the children of white traders and Indian wives, traveled to the fur country with pack trains of trading goods. And around the posts, in many places, the cabins of these trappers, with their families and children, made the beginnings of white occupation. From 1812 until 1846 the fur trade was the chief resource of the Far West. It seemed so permanent that Congress decided to use it as the foundation of a permanent Indian policy, and while Jackson was president the "Indian country" was created. (See Furs.)

Disposing of the Indians

It had become a hard problem to know what to do with the Indians. Since the beginning of settlement they had given way in the face of the advancing cabins of the pioneer farmers, moving always west. The states wanted them removed from their borders. White communities did not like Indians near by. By 1821, most of the area available for states had been used, and there remained for the Indians little more than the high plains and the American desert. President Monroe recommended that the Far West, beyond the western boundary of Missouri, be devoted permanently to Indian use. For 15 years, after 1825, with the full approval of Congress, the tribes were given homes on the new Indian frontier. Laws were passed to protect them from encroachment, an Indian Bureau was established at Washington to look after their needs, a special regiment of dragoons was organized to police the border, and the native Indians of the plains were persuaded to welcome as neighbors the emigrant Indians who were moved to the border from their eastern homes.

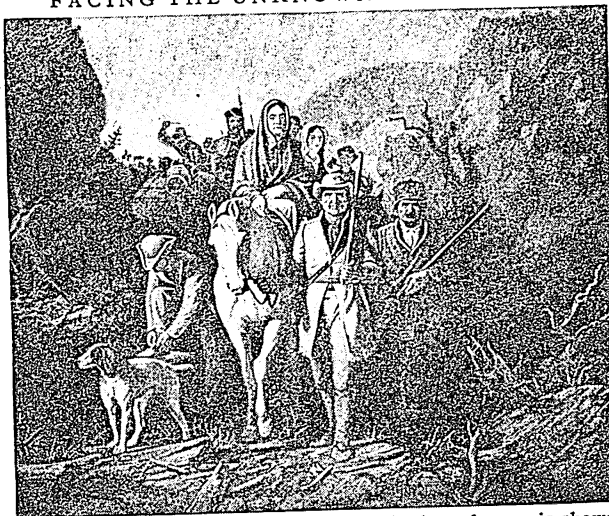
The Indian country, as it was called by law, was neither state nor territory, but a place where the Indians were colonized under special laws for their welfare. It stretched from the Red River to Canada, and from the western boundary of Missouri to the Rocky Mountains. But it was diminished as the years went on, for it was found that the notion of the American desert was largely myth, and no effective means was ever found by the government at Wash-

ington to keep white travelers, traders, and settlers out of the portion of the West allotted to its Indian wards.

The farmer pioneers did less to upset the security of the Indians of the Far West than did the overland trails which, for 20 years after 1830, carried thousands of home-seekers and adventurers from the settled regions of the United States to the Rocky Mountains and the Pacific coast. When Louisiana was bought, its western boundary along the Continental Divide was the westernmost limit of American growth. To the northwest lay the Oregon country, valued for its

furs and as a way station for ships in the China trade. To the southwest was California, dotted with missions, and with little colonies of Indians, retired soldiers, and traders growing up around the adobe walls of Spanish churches. Neither region lay within the range of probable expansion as yet; but before Jackson became president, occasional trappers scaled the passes of the mountains and discovered the charms of the Willamette Valley and the California country. Oregon was subject to claims of both England and the United States, and was

FACING THE UNKNOWN WITH BOONE



Daniel Boone, most famous of American backwoodsmen, is shown here escorting a brave band of "homesteaders" into the threshold lands of the Far West. This eloquent picture was painted by George Caleb Bingham and now hangs in the City Art Museum at St. Louis, Mo.

held in joint occupation until the owners could agree how to divide it. It came into the American view when in the early 30's the trappers began to send parties up the Missouri River and the Platte, and into the valleys of the Columbia. Missionary societies developed an interest in the Indians. The famous Marcus Whitman took his bride to the mission farm at Waiilatpu; an Indian agent went out from Washington in 1842; and in the spring of 1843 there gathered near the bend of the Missouri River, on the edge of the Indian country, more than a thousand home-seekers who were determined to risk the nine months' overland trip for the sake of farms in Oregon. In 1846 England and the United States divided the Oregon country along the line of 49 degrees north latitude, and the overland trails had become a reality.

To the Indians the trails were a calamity, for they carried thousands into the Indian country, and dispelled the delusion that the Far West was a desert. But to the farmers of the Middle West they were the channel of the greatest long-distance migration in American history.

Most Famous of the Trails

The Oregon Trail was the route of the emigration of 1843, and was most famous of all the routes. Francis

Parkman, the great historian, visited it while it was new and described it in a book that is still famous, 'The Oregon Trail'. It began, where most of the trails began, at that stretch of the Missouri River where the stream, after flowing southeast across Dakota, turns south along the western boundaries of Iowa and Missouri, and then turns sharply eastward at the mouth of the Kansas River, to flow into the Mississippi near St. Louis. Eastern roads crossed the Missouri River at many places above the mouth of the Kansas, but the bend of the river at this point became known as the "great bend," or the bend of the Missouri, and was the starting point for trader, soldier, explorer, or emigrant bound west.

Each year, in May, when prairie grass was soft and prairie roads were dry enough to carry loads, the overland emigrants gathered along the Missouri above the bend, completing their outfits at the stores near Independence. Their covered wagons, "prairie schooners," were much like the heavy wagons built by the Pennsylvania Dutch in the Conestoga country on the Susquehanna, and called sometimes "Conestoga" and sometimes "Pittsburgh" wagons. The heavy wheels carried great wooden bodies, and these were covered with canvas tops supported on bows of bent white oak. Drawn by horses or oxen, with families trudging alongside driving the cattle and other live stock, the wagons made up caravans that crawled along the trail. At dusk, the captain of the caravan (for the emigrants organized under a captain for safety from the Indians), directed the halting of the wagons in a circular corral, where the wagons made an enclosure into which the cattle were driven for the night, and from which they could be neither stampeded nor stolen by the savages.

The Course of the Oregon Trail

The main highway, well trodden by 1846, left Westport Landing, or Independence, at the mouth of the Kansas, and ran across country to the Platte River, at the head of Grand Island. Here was Fort Kearney, built to protect the travelers and to outfit them. The main Oregon Trail followed the south bank of the Platte to the junction of the North and South forks, and then followed the south bank of the North Platte through Mitchell Pass (for picture see Nebraska) to the mouth of the Laramie River, where was another of the "service stations," Fort Laramie. A band of religious emigrants, the Mormons, who ascended the Platte in 1847 followed the north bank, which was hereafter known as the Mormon Trail. But both trails merged as one along the Sweetwater branch of the North Platte; and beyond the head of the Sweetwater the wagons crossed the Continental Divide through South Pass, which had been first visited by fur traders about 1823 (see Wyoming). West of South Pass the Oregon Trail followed the Snake River, passing Fort Hall; and it ended in Oregon, where the Snake and Columbia merge near Walla Walla.

The trail was bordered with the many graves of those who died on the way, and with the goods which

were discarded from the wagons as the animals became too worn out to draw heavy loads. There were broken wagons, abandoned where they broke, and the skeletons of horses and oxen, picked clean by the coyotes who howled around the camp-fires every night, and scavenged the camp-grounds as the travelers pulled out.

By 1848 the trail had carried a community into Oregon, and Congress made it a territory. And already many home-seekers had abandoned Oregon as a destination, and had deviated southwest from the Great Salt Lake to the Humboldt River, the Carson Sink, and the Sierra Nevada entry into California. American occupation of the Pacific Slope was begun.

The Great Santa Fe Trail

Southwest from the bend of the Missouri, the Santa Fe Trail ran across the plains to New Mexico. Here Pike had seen a market in 1807. Regular use of the trail had begun after Mexican independence in 1821, with the wagons crossing the Kansas plains to the great bend of the Arkansas River. The main routes ascended that stream to the mouth of the Purgatoire, near La Junta in Colorado; thence up the Purgatoire (Picket-wire, as the illiterate plainsmen sometimes called it), across the Raton Pass, and down the slopes to the picturesque old town of Santa Fe. There was a short cut, dry and dangerous, that crossed the Arkansas near the Mexican boundary at 100 degrees west longitude and ran through the country of the Cimarron River, entering Santa Fe from the east. Important as it was, the Santa Fe Trail—and its extension to California, the Spanish Trail—was not an emigrant road; it was used chiefly by traders, whose prairie schooners full of goods raced across the plains and followed the market down the Rio Grande, sometimes crossing the Chihuahua desert below El Paso and penetrating as far south as Mexico City itself.

It is probable that the migrations to Oregon and to California would, within a few years, have produced an Americanization of the latter even had there not been a war with Mexico. As it turned out, however, war hastened the process. When in 1846 preparations were made to invade Mexico, an army was assembled on the border, mobilized at Fort Leavenworth (which had been built in 1827 to protect the Santa Fe trade), and marched into New Mexico under command of Stephen Watts Kearny. From New Mexico Kearny, guided by Christopher (Kit) Carson (see Carson, "Kit"), proceeded to Upper California, as California north of San Diego was called. When he arrived at Los Angeles, he found California already largely conquered by the joint work of the navy and of resident United States citizens, and at the head of the latter was the picturesque character of the period of the migrations, John C. Fremont.

Fremont, the "Pathfinder"

Fremont was a young engineer attached to the army, and was already known as "the pathfinder"

before the Mexican War. He had, in 1842, been sent to survey the trail to South Pass. In 1843-44, he had been ordered again to the Far West; this time to the Columbia country from which he returned by way of California and a southern trail. West again in 1845, no one knows quite why, he was on the margin of the Spanish settlements when the Bear Flag Revolt broke out in 1846, and placed himself at the head of the American settlers who coöperated with the army and the navy in the conquest of California.

With the trails in operation, the Indian country was doomed. In 1849 the gold rush to the California camps broke all records for migration, and active mining camps began calling for government and protection. In the great compromise of 1850, the Pacific Slope was organized with California as a state, and Oregon, Utah, and New Mexico as territories. Four years later, with the repeal of the Missouri Compromise, Kansas and Nebraska territories were cut out of the Indian country, reducing the latter to the dimensions of the present state of Oklahoma.

In 1858 the famous overland mail service, with coaches running from Missouri to California, made its appearance. The traveler in one of these expected to spend nearly three weeks in the cramped quarters of a Concord coach, with little sleep and poor food provided at the stations where the horses were changed. In 1860 the "pony express" was run from St. Joseph to Sacramento, the riders carrying tissue paper letters in their saddle-bags, and rushing through on the fleetest ponies the owners could provide. On this service the young Buffalo Bill learned his Far West. When the electric telegraph supplanted the pony express in 1861 Cody turned scout and hunter. He provided buffalo meat for the construction gangs that built the continental railways. In 1869 the remote sections of the United States were connected by the Union Pacific road, and the importance of the wagon trails diminished. In 20 years more the railroads crossed and recrossed the old desert; the irrigation ditch made the dry lands bloom; and the high plains, nearly freed of Indians, entered upon their last phase as the "cow country."

The Days of the Cowboy

The vast herds of cattle, bred in Texas, and driven north across the plains to shipping points in Kansas, Nebraska, or Montana, could never have been profitable before the packing industry was developed to handle their products, or before the railroads reached the edge of the plains to carry the steers east to the slaughter houses. Suddenly, about the close of the Civil War, the business made its appearance. The cowboys, as the cattle tenders were called, captured the imagination of the United States and have held it ever since. Living in the saddle, riding the margin of the herds, eating from the "chuck wagon" that accompanied them, singing the ballads of the plains, and alternating long periods of loneliness on trail with short and wild carousings in the "cow towns"—Dodge City, Abilene, or Ogallala—the cowboys

became the stuff of fiction and romance. Around them Owen Wister wrote their epic, 'The Virginian'. Theodore Roosevelt, fresh from college, bought a ranch and acquired the interest that evoked his 'Winning of the West'. And in 1883, from their ranks, Buffalo Bill recruited the staff of his Wild West Show, whose performances carried the flavor of the Far West to the world outside.

Then at last the frontier disappeared, leaving no portion of the earth where such a story could be repeated. New states, with farms and cities, high schools and universities, telephones and farm machinery, filled out the map of the United States. But the memory of the Far West lingers, with romance and adventure and rich personality. For the United States it is a precious memory. (See also "Buffalo Bill"; California; Cattle; Lewis and Clark Expedition; Louisiana Purchase; Oregon.)

FASCISM (*fäsh'izm* or *fäs'izm*). The name "fascism" was first used for the political system developed in Italy by Benito Mussolini after he rose to power in 1922. It has since been applied to political doctrines elsewhere which in principle or in practise resemble those of Italy's fascist government.

The term comes from the ancient Romans, who gave the name *fascēs* to the bundle of rods strapped around an ax which was carried by the lictors or attendants of the higher Roman magistrates. The *fascēs* were symbols of authority to flog or put to death. Later the symbol came to represent the strength of the people when united around a central government. In this sense it has been used by many modern nations. You will find the *fascēs* stamped on the reverse of United States dimes, together with the inscription, *E Pluribus Unum*, "Out of Many, One."

In Italian the word *fasci* means "bundles" or "units." The small groups which Mussolini organized from among ex-soldiers after the World War were called *fasci di combattimento*, or "battle units," to indicate that they were ready to take up arms again, if necessary, to achieve their goal.

Aims of the Italian Fascists

What was the goal of these *Fascisti*, as they came to be called? They proposed to solve first of all the desperate and immediate problems of postwar Italy. The people were indignant at the peace settlement, which gave Italy a smaller share of reparations and new territory than it had expected. Disorder, confusion, and poverty reigned. Returning soldiers found no jobs. Strikes without responsible leadership and communist revolts crippled industry. The government was almost paralyzed. Its heads yielded first to one and then to another of the many political factions.

To all discontented people, the Fascists offered a program of direct action. Drive out the politicians! Put down disorder! Make Italy strong! This was the first simple program, backed by the powerful personality of Mussolini.

How the Fascists won power and reorganized Italian political and economic life is told in the articles on

Italy and Mussolini. The spirit and fundamental principles of fascism (*fascismo*) grew more out of what Mussolini did to meet Italian problems, than out of theories formulated in advance. The extremes of fascist doctrine, as it later was developed, proved startling, even to many in the Fascist party.

The Doctrines of Fascism

The philosophy of fascism holds that the state is the supreme unit in human affairs. The individual counts for nothing, except as a "cell" in the political, economic, and spiritual life of the state. By himself he has no rights which the state is bound to respect. This is self-evident, says the fascist doctrine, since outside the state's protection the individual is powerless. His freedom of action, his property, his very life are privileges extended to him solely through the power of the state and they may be withdrawn if the welfare of the state requires it. A state so governed is called a *totalitarian state*.

This doctrine is as far removed as possible from the philosophy of democracy with its belief that the power and authority of the state are derived from the will of the people and delegated to their chosen representatives (*see Democracy*). Under fascism, authority begins at the top; the head of the state is the supreme interpreter of the state's will; he is and *must be* a dictator; and such delegation of power as takes place is from the top down. Fascist dictators usually leave property and business affairs in private hands on the ground that the economic welfare of the state is best served by private ownership; but the management of property, business, and finance is strictly and minutely regulated.

How the Dictator Rules

For a dictator to wield so great a power over a whole nation, new machinery is needed. The regular agencies of the state—legislatures, courts, and administrative departments—become means for transmitting advice and suggestions to the dictator and for enforcing his decisions. In addition, special agencies may be set up, like the "labor syndicates," "employers' associations," "state corporations," and "Council of Corporations," which together form Mussolini's "corporative state" (*see Italy*).

Through his control of the police and the army, a fascist dictator can compel obedience by force. But the fascist doctrine calls for more than mere obedience. The spirit of the people must be shaped to an enthusiastic endorsement of the "national ideals." Fascist governments, therefore, use every device for arousing this enthusiasm. Schools, newspapers, radio stations, public speakers, and other molders of public opinion are forced to become instruments for spreading government propaganda.

Under fascism, "The Leader" (*il Duce* in Italian, *der Führer* in German) not only stands at the top of the government pyramid and of the economic system; he is also head of the fascist organization, part political party and part private army, which brings fascism to power and later suppresses all opposition.

This privileged party-army ("Blackshirts" in Italy, "Storm Troops" in Germany) is a distinguishing feature of fascist governments.

Fascism in Other Countries

First to be influenced by Mussolini's example was Primo de Rivera, who from 1923 to 1930 attempted to apply fascist methods in Spain. Out of postwar chaos in Turkey rose the dictatorship of Mustapha Kemal Atatürk. Hitler's National Socialism came to power in Germany in 1933, followed by Kurt Schuschnigg in Austria and General Metaxas in Greece. The systems set up by these dictators varied greatly in details of government, but they shared the fascist opposition to democratic institutions. In many other countries fascist parties grew up. Because of its emphasis on nationalism, fascism everywhere strongly opposes international socialism and communism. (*See also Austria; Germany; Greece; Hitler, Adolf; Poland; Spain; Turkey.*)

FATES. Human destiny, according to the ancient Greeks, was controlled by three Fates: Clotho, the spinner of the thread of life; Lachesis, who determined the length of the thread; and Atropos, the inevitable, who cut the thread. They were represented sometimes as young maidens, but more often as old and hideous women. Neither gods nor men could escape from their fixed decrees.

FATS AND OILS. One of the ways in which well-fed animals lay by food energy for future use is by manufacturing and storing in their bodies *fats*, including the liquid fats called *oils*. Plants also make fats and store them in their fruits and seeds for the future benefit of their offspring. All fats and oils are of similar living origin. Even the mineral oil, petroleum, has been transformed from animal fats and oils buried ages ago beneath the surface of the earth (*see Petroleum*).

In living creatures, the stored-up energy in fats and oils is held in the form of chemical structures which yield high fuel value when burned in the body. Men use this fuel value in their own bodies when they eat fats or oils (*see Food*). They also use it when they burn oil as fuel in furnaces and engines.

Fats and oils have another chemical property, valuable to living creatures, and also useful to man in many of his manufacturing activities. To remain stored in living tissues, fats and oils must be insoluble in the watery liquids which surround them. Enzymes are required to break them up for digestion (*see Enzymes*). Nature makes use of this waterproof property by putting oil into the skins of animals and the protective coverings of seeds and plants. Men make use of it in paints and many other ways. The physical and chemical structure of fats and oils makes a great proportion of them useful also as lubricants.

Principal Animal Oils

Butter, lard, tallow, neat's-foot oil, various fish oils, and whale oil are among the most widely used animal oils. Lard, the most important of the fats with the possible exception of butter, is the melted

and purified fat of hogs. It is much used in cooking, and in some countries it is eaten with bread. Tallow is melted sheep- or cattle-fat. Formerly used for candles, nearly all of it is now made into oleomargarine. The highest grade of tallow is called "oleo stock"; it is put into presses which separate it into "oleo oil" and the solid "oleo stearin." Tallow and oleo oil are among the most important of the materials used in the soap industry (*see* Oleomargarine; Soap).

Important Vegetable Oils

Chief among vegetable oils are olive, cottonseed, linseed, corn, soy-bean, almond, coconut, peanut, castor bean, babassu, and poppy-seed oils. Most of them are obtained by pressing the seeds or fruit in special presses; most animal oils are "rendered," that is, extracted, by heating in steam or water.

Oils that have the property of rapidly taking up oxygen when exposed to air and drying with a tough elastic surface are "drying oils." They are important in making paints and varnishes. Linseed oil is most commonly used for this purpose (*see* Flax; Linoleum; Paints). China wood oil, or tung oil, which is used in varnishes, is superior to linseed oil because it produces a harder surface and dries more rapidly. This oil, an extract from the nuts of the tung tree, is mostly imported from China; but the tung tree is now grown in the Gulf states.

"Non-drying" oils do not harden, but gradually decompose and become rancid when exposed to the air; olive oil is an example. These oils are chiefly used as food and in soap manufacture. The most important after olive oil is cottonseed-oil, of which the United States furnishes 70 per cent of the world's production (*see* Cotton).

Corn oil is another important food oil. It is a by-product of the manufacture of glucose and cornstarch, being pressed out of the tiny germ portion of the corn kernel (*see* Corn). Soy-bean oil has in recent years become one of the most widely used non-drying oils (*see* Soy Bean). It dries more readily than most oils of this class, and is being developed into a partial substitute for linseed oil in paints and varnishes.

Coconut oil is used both as a food and in making soap. About one-half of the supply used in the United States is imported as oil and the rest is pressed from "copra," the dried coconut meat imported from the Philippines, Ceylon, and other points of the Far East (*see* Coconut Palm). Peanut oil, used chiefly as a salad oil, comes for the most part from China and Manchuria. Olive oil, pressed from olives, is the best of all oils for salad oils and for soap-making, but comparatively little of it is used in the United States because of its high cost. Nearly all the supply is imported from France, Spain, and Italy, where the olives average two to three times as much oil content as do California olives. Much of the oil sold as olive oil is adulterated with cottonseed and corn oils (*see* Olive). Palm oils, including babassu oil, come from African and South American palm nuts. They are used for food, for soap, and in the manufacture of

tinplate and textiles (*see* Palm). Castor oil, made from the castor bean, comes chiefly from India. It is valuable in making fine lubricants, soap, and sticky fly-paper, and in medicine (*see* Castor Bean).

When the oils are pressed from cotton, flax, and other seeds, the hulls are left in the form of hard oily cakes called *oil-cake*, which is ground into meal and used both as feed for animals and as fertilizer. Cottonseed meal, linseed meal, and castor-pomace are all rich in nitrogen and therefore exceedingly useful for both these purposes.

Chemically, oils and fats are mixtures of carbon-hydrogen-oxygen compounds, chief of which are *olein*, *stearin*, and *palmitin*. These can be decomposed into glycerin and the fatty acids known respectively as *oleic*, *stearic*, and *palmitic* acids. In soap-making, oils and fats are boiled with alkaline solutions; the fatty acids combine with the alkalies to form soap, and the glycerin is separated as a by-product.

For practical purposes we apply the term fats to substances that are solid at 68° F., and oils to those which liquefy at that temperature. All fats become fluid at comparatively low temperatures.

Essential or Volatile Oils

All the substances so far discussed belong to the group of "fixed" fats and oils. Sharply distinguished from them in origin and character are the *essential* or *volatile oils*. The latter contain in highly concentrated form the odors of the plants from which they come, and hence are largely used for perfumes, flavorings, and in medicine (*see* Perfumes). Turpentine is one of the commonest of essential oils. Others are the oils of lemon, clove, peppermint, spearmint, eucalyptus, cedar, and bitter almonds.

FAUST (*foust*) **LEGENDS.** In the early 16th century there sprang up, first in Germany and later in other countries in Europe, various tales of a magician, Dr. Johann Faust, who was in league with the devil, performed marvels with the aid of the evil one, and practised the black art. There seems to be little doubt that a soothsayer of this name really existed (he is said to have died in 1538), but the facts of his life have been lost amid the legends which have crystallized about him. He was represented as a charlatan who traveled from place to place in Germany, living by his wits, and claiming to be a physician, alchemist, and astrologer, and a great magician.

Faust first appears in literature in the 'Historia von Dr. Johann Fausten', published at Frankfort in 1587, which contains most of the famous stories told of him. It relates how he sought to acquire supernatural knowledge and power by a compact with Satan. This pact, signed with the blood of Faust, set forth that Mephistopheles, a devil, was to become his servant for a period of 24 years. Faust agreed to give himself up to Satan at the end of that time. Mephistopheles entertained his master with high living, long discussions on the relation of the devil towards God, the nature of heaven and hell, the eternity of punishment for sin, and with glimpses of the spirit

world. At the end of the 24 years, in the midst of an earthquake which shook his house, Faust was carried off by the devil.

The story gained wide popularity and was used as a theme by many writers. It became the subject of a great dramatic poem, 'The Tragical History of Doctor Faustus', by Christopher Marlowe, the father of English tragedy (1589). Strolling players introduced the play into Germany where it degenerated into puppet-plays and Punch and Judy shows, until Goethe at the opening of the 19th century raised it to quite another level.

There gradually crept into the Faust legends the shadowy figure of a beautiful young German girl, Gretchen, a daughter of the common people, with whom Faust fell desperately in love. This element of the story grew and grew in importance until in the hands of Goethe it blossomed into the charming personage of Margaret, whose betrayal by Faust is one of the dominant notes in Goethe's poetic tragedy 'Faust'. This is unquestionably the greatest treatment of the legend. Contrary to the early versions, Mephistopheles fails to absorb Faust completely in the pleasures he provides—one of the conditions of the compact in Goethe's poem—and the result is the ultimate salvation of the magician. Gounod's opera 'Faust', adapted from Goethe's tragedy, was first produced in Paris in 1859. Rembrandt was one of many artists who illustrated the legend.

FAWKES (*faks*), Guy (1570–1606). For more than 300 years the fifth of November has been celebrated in England by the burning of stuffed figures of this Gunpowder Plot conspirator (from which comes our phrase to "look like a guy"), while the children sing:

Remember, remember, the Fifth of November,
Gunpowder, treason, and plot!

I see no reason why Gunpowder treason
Should ever be forgot.

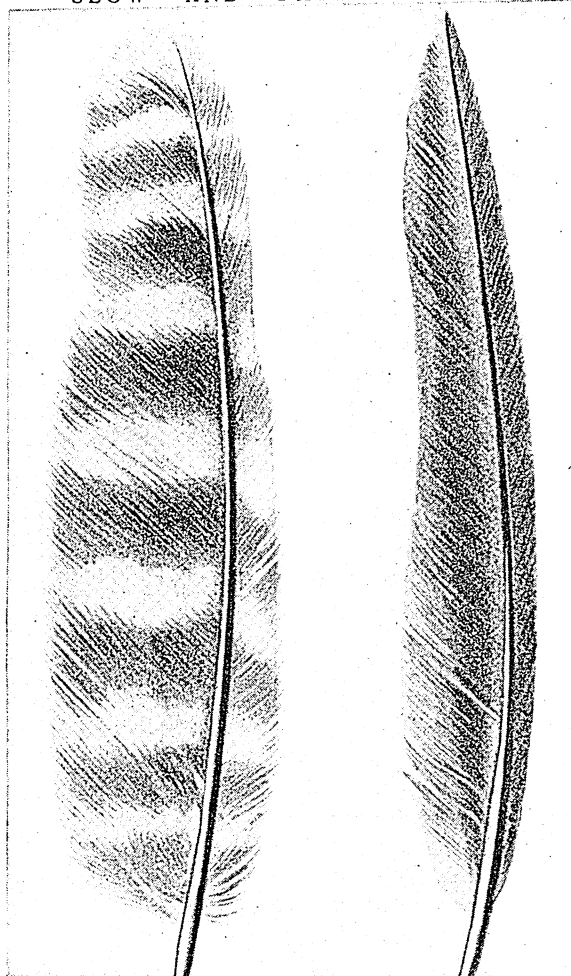
This old custom keeps alive the horror felt by England in 1605 when Guy Fawkes and his friends, because of Catholic discontent, tried to blow up King James I and Parliament. They succeeded in storing 30 barrels of gunpowder in a cellar under the Parliament House, but before Parliament opened, on November 5, the plot was discovered. Guy Fawkes and his helpers were executed.

FEATHERS. A feather is a horny product of the skin of birds, of which it is the distinctive characteristic. It arises from a nipple at the bottom of a pit in the skin that begins to form long before the embryo is hatched. Around this nipple there forms a cap of secreted horny material that presently becomes loosened and is pushed up by another cap forming beneath it. Thus a tube results, which is the shaft or "quill" of the feather, and in which the succession of "caps" may usually be seen. When the full size is reached the process ceases, the root end of the quill closes, and the feather is easily pushed out and discarded at molting time by the new growth.

These feather-making pits are not uniformly distributed over the body except in a few primitive

remainders of extinct groups, such as the ostriches and penguins. In other species they are distributed in certain narrow tracts, differing in and characteristic of various systematic groups of birds; and in life the

"SLOW" AND "FAST" FEATHERS



The soft, loose-edged feather on the left is from the owl. Because of its softness the owl's flight is slow and noiseless, which is more important to the owl than speed. Feathers "built for speed" are hard and trim, like the pigeon feather on the right.

naked tracts are hidden by the overlapping "plumage," as the general coat of feathers is termed.

This plumage is preceded in the nestling by one or more coats of small immature feathers ("down"), which are successively shed and replaced until the final mature coat is obtained. Even the mature feathers are not intended to be worn always. They become worn and torn (often causing thereby a seasonal change of coloring, as in bobolinks), and once, or in some cases twice, a year are shed, or "molted," and replaced by a new growth from the same sources. These molts may result in differences in color and form of plumage according to the season.

The Two Parts of a Feather

A feather consists of two parts, the "quill" and its horizontally branching growths that form the "vane"

in various shapes. Sometimes these branches are disconnected, or nearly so, as in downs and in ostrich plumes; but ordinarily they carry branchlets, or "barbs," that hook together at their adjacent tips in a firm but elastic web, especially strong in the large "flight feathers" of the wings and tail. The vane may be nearly or quite absent from some feathers, as in the bristles about the mouth of flycatchers; or it may become solidified into scales, as in penguins. These variations in delicate structure are unlimited, and, together with its capacity for color, make a feather one of the most beautiful things in nature.

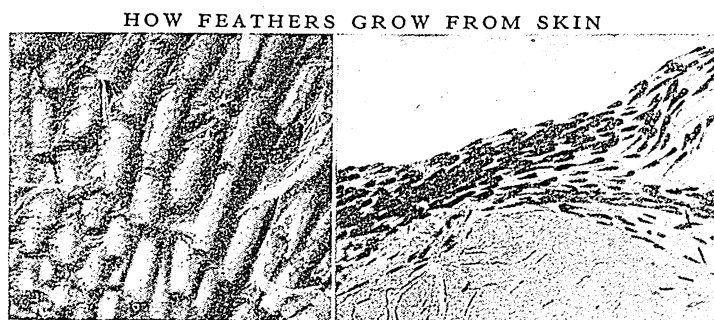
The color of feathers may be due to contained pigments, or may result from mechanical conditions. The pigments are apparently waste products of the blood, and consist of black, red, yellow, and in some cases of a red or a green peculiar to certain families of birds. These may be generally diffused, or exist in combinations that give intermediate tints, or be modified by colorless structures in the feather, as in most blues; and so an infinity of hues and patterns is produced from a few color elements. White is the appearance resulting from innumerable air-spaces. Iridescent feathers, such as those on the neck of the "burnished" dove, or in the gorgets of hummingbirds and the tail of the peacock, are prismatic in character—"that is, a blackish pigment may lie beneath the surface, which, whether polished, ridged, or pitted, acts as a series of prisms, causing the hue to vary according to the relative position of the spectator's eye and the light."

Why Feathers are So Much Better than Scales

Compared with scales, and to a less degree with hair, feathers form a warm covering. In this fact perhaps lies the secret of the success of the developing class of birds in the constantly cooling and drying climate, and change of conditions generally, that killed off the big leather-hided or scaly reptiles of the late Mesozoic days in which the class arose. The acquirement of feathers meant not only a lighter and more flexible covering than scales, but one that would retain the natural heat of the body (which amounts to something even in "cold-blooded" creatures), and would at the same time keep out the coldness of chilly air or water. The increase of warmth thus brought about meant a steady increase in warmth of blood (a bird now has a higher temperature than any other animal), and that tends to produce an enlargement of bodily activity and a stimulus to brain and life in every way. Added to this was the new power

of flight, enabling a bird more easily to escape enemies and to flee to better conditions or seek food over a wide area. Feathers helped to lift bird life above its reptilian origin.

The qualities of softness, elasticity, and conserving heat make feathers valuable to man in many ways, such as the use of goose and eider duck feathers for bedding. Their beauty has made feathers popular as ornaments of dress in all lands and ages.



On the left we see how the stumps of the feather quills fit into the skin of the great bustard. At the right is a section of a song thrush's skin, greatly enlarged, with young feathers commencing to grow out of it. The black dots are the beginnings of the feathers.

FEBRUARY. In the old Roman calendar February (from *februaire*, meaning "to purify"), the second month of the year, had 29 days. It was robbed of a day to make August, named in honor of the Emperor Augustus, as long as July, which had been named for Augustus' predecessor Julius Caesar. In leap year February recovers its 29th day. (See Calendar.)

FEDERAL RESERVE SYSTEM. Before 1913, American business suffered for lack of an "elastic" currency which could be increased or decreased in total amount according to business needs.

In good times, the banks could not obtain cash enough to serve as reserves for protecting the credit money they created by granting loans (see Banks and Banking). In bad times, when business men most needed help, they had to call in loans and pile up cash reserves in their vaults. These defects led Congress to pass an act drawn up by Senator Carter Glass of Virginia and approved by President Wilson Dec. 13, 1913, creating a Federal Reserve system to function like the "central banks of issue" in other countries.

The system rests upon twelve district Federal Reserve banks. All national banks were required originally to subscribe to their stock. State banks may join if they wish. The reserve banks are controlled by a board originally called the Federal Reserve Board; the Board and reserve banks together have broad powers to control the amount of currency and bank credit in the country.

Old evils, such as "tight money" in the West during harvest time, are met by letting member banks keep their legal reserves on deposit in the reserve banks instead of in their own vaults. The system thus can provide money wherever needed, without disturbing the reserves of individual banks. The reserves now required are 26 per cent in central reserve cities where the reserve banks are located, 20 per cent in cities served by branches, and 14 per cent elsewhere.

Control of outstanding currency and credit is provided by the system's powers of *rediscount* and *issue*. Any member bank can pledge, or rediscount, with a reserve bank eligible notes and other obligations

given by its customers to secure credit. The reserve bank then issues *Federal Reserve notes* or credits the member's account, in payment of the rediscount. Either method gives the member bank a legal reserve to serve as a basis for extending further credit to customers. This ends the old "tightening" of credit forced in good times by inability of the banks to get money or government bonds (see Money) for maintaining reserves. On the other hand, the Federal Reserve system can contract credit in unhealthy "boom" times by raising its rate, or charge, for rediscounts. This forces member banks to charge their customers higher rates and tends to limit extension of credit to sound enterprises that can afford to pay higher rates for borrowed money. The reserve banks also have been empowered to issue *Federal Reserve bank notes* secured by government bonds.

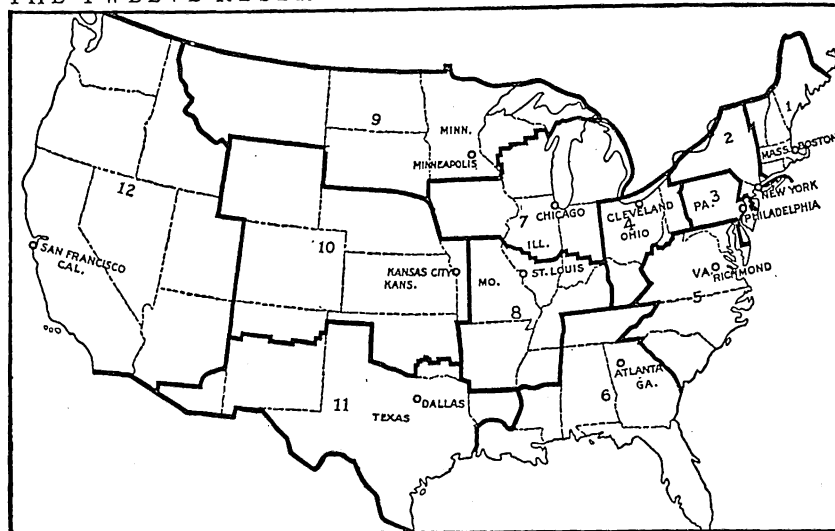
Lastly, the Federal Reserve system can conduct *open market operations* in government bonds and other prime securities. By purchasing such obligations, the system supplies banks with cash reserves and thereby permits expansion of credit. By selling such obligations it draws in cash, decreases reserves, and contracts the available amount of credit.

Under the Banking Act approved Aug. 23, 1935, the president of the United States appoints seven members of the Board of Governors for 14 years, and names one as president. This board replaces the former Federal Reserve Board. Directors of the district reserve banks are chosen thus: Class A, three bankers, and Class B, three non-bankers, by the member banks of the district; Class C, three, by the Board of Governors. Five regional representatives of the reserve banks and the Board of Governors form an Open Market Committee to control credit policies.

FEDERAL TRADE COMMISSION. President Wilson's administration felt that many "big business" abuses were difficult to correct under the anti-trust laws. Congress therefore passed an act approved Sept. 26, 1914, which stated that "unfair methods of competition are hereby declared unlawful," and created a Federal Trade Commission to enforce this declaration. Decision as to "fairness" was left to the Commission; but court review of its findings was provided by requiring that it apply to the United States Circuit Court of Appeals for enforcement of its orders.

The Commission's work under these powers has been divided between investigations and hearing complaints from individuals and companies. If the defendants contest the findings of the Commission's examiners, the Commission holds a hearing amounting to a trial. The Commission then may issue an order to

THE TWELVE RESERVE BANKS AND THEIR DISTRICTS



The map shows the twelve central reserve cities containing the twelve Federal Reserve banks, with the district served by each bank. Note that the district lines cut through states, for convenience in serving the business regions related to the cities.

the defendant to "cease and desist" from the unfair practise. Defendants who admit their guilt to the examiners, however, are often permitted to make a *stipulation*, or admission of facts. In this, the defendant promises to stop his unfair acts. He thus avoids the expense of a hearing by the Commission.

By thus suppressing monopolistic or corrupt practises, the Commission aids small businesses. Amendments passed in 1938 empower it to protect consumers also. Especially important for consumers is the Commission's power to forbid advertising that makes false claims for food, drugs, or cosmetics.

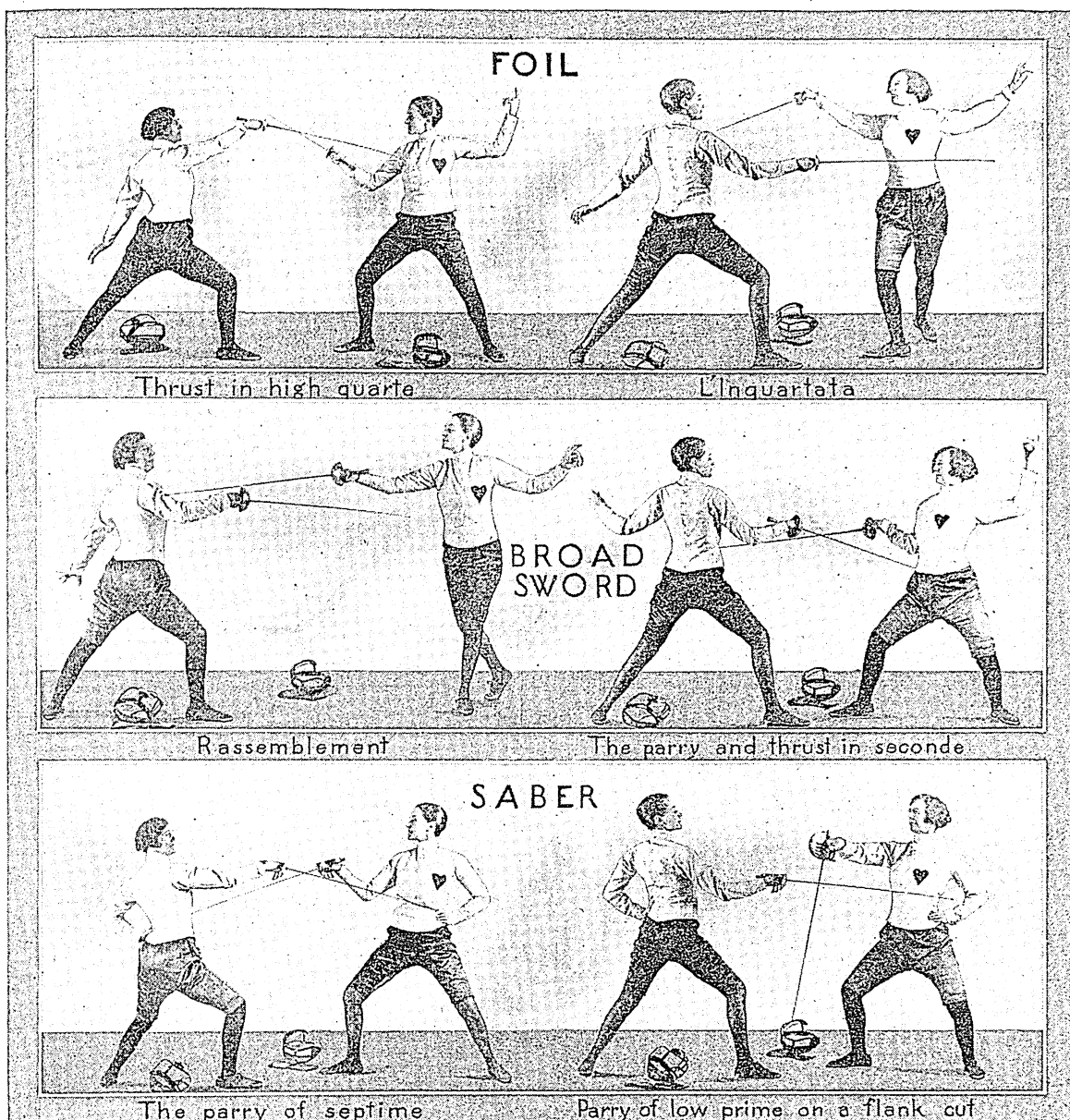
Under the amendments of 1938 the orders of the Commission, unless appealed within a certain time, become final without court review. Imprisonment or a fine is provided for disobedience. The Commission has five members, appointed by the president for seven-year terms. (See also Trusts.)

FELDSPAR. Feldspar and quartz are the parents of most other rocks; feldspar (or felspar) alone forms about half the earth's crust. Granite and related rocks contain it, and nearly pure masses called *pegmatite dikes* occur. When pulverized and fused, it becomes a tough glasslike substance.

American industry uses up to 275,000 tons a year, chiefly in making a type of glass which is especially durable because of the aluminum content of feldspar. It is also used as a glaze for pottery, sanitary ware, and tile; as a binder in pottery and in emery wheels; and as an abrasive in scouring soaps.

The United States supplies from one-half to three-fifths of the world's annual output. The chief producing states are North Carolina, South Dakota, Colorado, and New Hampshire. Foreign producers include Sweden, Norway, China, Canada, and Germany. Feldspar is aluminum silicate combined with silicate of potassium, sodium, or calcium. (See also Minerals.)

ONE FORM OF DUELLING THAT HAS BECOME A SPORT



Fencing skill was essential to life in the days of street brawls. Today it is a graceful athletic exercise. Our photographs show various "thrusts," or attacks by one fencer, and "parries," or strokes to ward off the attack by the other fencer. A fencer strives to touch his opponent with his foil, while avoiding being touched. Foils are used for practise work, broadsword and saber for more advanced work. Terms such as "quarte," "l'inquartata," "septime," come from France and Italy, where fencing was developed.

FELT. A fabric formed without weaving by matting together fibers of hair, wool, or fur with the aid of moisture and heat by a process of rolling, beating, and pressure. Felt is used for many purposes, such as hats, billiard table covers, pennants, counter mats, piano hammers, and polishers. In Asiatic countries floor coverings of felt have been made from remote antiquity and are still widely used.

FENCING. Quickness of eye, speed of thought, and swiftness of muscle are of the essence of fencing. The fencer faces his opponent with every nerve in his

body alert; he stands poised with his foil darting in and out like a flash of light. Suddenly he sees his opening; he has only the merest fraction of a second in which to take advantage of it, but he does not fail. With a lightning-like movement of arm and wrist and body he sends his button-tipped foil to his opponent's breast and scores a well-earned point.

Fencing is one of the finest exercises in the world. It gives poise, grace, suppleness, and strength on the physical side, and judgment, self-control, initiative, and quickness of thought on the mental side. One of

its advantages is that it is equally adapted to boys and girls, men and women.

The equipment needed for fencing with foils includes a tight-fitting padded jacket, a mask made of strong material, a button-tipped foil of flexible steel, and a glove that comes well down on the wrist of the fencing arm.

The position that a right-handed fencer takes when "on guard" ready for a "bout" is with his feet well apart, his right hand bent and pointing toward his opponent, the foil held slightly forward, and his left arm lifted so that the hand is about level with the top of his head. When he "lunges" he throws his right foot forward a few inches, bends his knee at right angles, and, straightening his foil arm, thrusts his weapon quickly at his adversary, at the same time lowering his left hand to a point within a few inches of his left thigh. A "feint" is a movement to mislead; a "parry" is the warding off of the opponent's foil. There are eight simple parries, known as *prime*, *seconde*, *terce*, etc.

You do not need to be an expert to enjoy fencing, for it is an easy matter to learn the simple attacks and parries and the farther one goes in the sport the more fascinating it is, for there is unlimited opportunity to develop skill and *finesse*.

The history of the sport is interwoven with the history of mankind, for it started centuries ago in those lawless days when a man's life was not his own unless he could defend himself with the sword. Henry VIII of England was the first to give fencing a recognized standing as an English sport.

FERMENTATION. When milk sours or bread rises, when fruit decays, when you digest food, when alcohol is produced in sugary substances and when that alcohol turns again to vinegar, you have in every case an example of the process called fermentation.

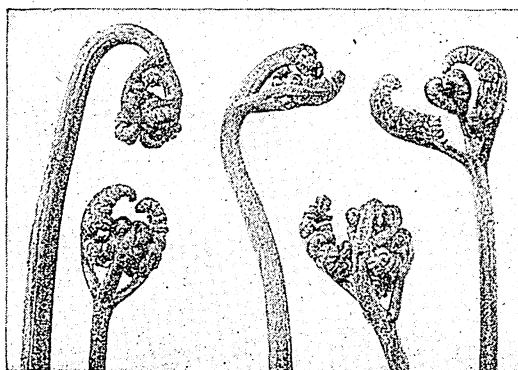
Fermentation is always due directly or indirectly to living organisms, and consists of the breaking up of some substance into simpler forms. Common yeast, for instance, which is a mass of tiny plants akin to the bacteria, breaks up sugar into alcohol and carbon dioxide. This change is not caused directly by the yeast but by a substance called an "enzyme" produced in the living body of the yeast. Similarly our own bodies produce the enzymes which help digest our food. In the case of sour milk, butter, and cheese, the enzymes from certain types of bacteria produce the lactic and butyric acids that change the quality of the milk. Decay or putrefaction is similarly caused by a type of bacteria called *saprophytes*. (See Alcohol; Bacteria; Enzymes; Yeast.)

PLANT SURVIVORS *from the* COAL AGE

FERNs. Most of the ferns can be recognized at a glance by their characteristically shaped leaves, popularly known as fronds. These possess a single midrib, with little leaflets branching off from either side, making the whole frond look like a large heavy green feather. This is the plan on which most fern fronds are built, though many are constructed somewhat differently. In most common ferns each frond grows directly from a creeping stem or rootstock under the ground, and so the plant resembles a bunch of large green feathers stuck into the ground. Usually the fronds are a beautiful bright green, though some are a dark shiny blue green; and they are delicately cut into fine toothed or lobed edges.

Most of the ferns live in damp places in woods or ravines. With the exception of one or two hardy

THERE was a time, ages and ages ago, when ferns were the highest kind of plants that grew. For a long time Nature apparently tried to see how many thousand varieties of mosses and ferns she could make. Most of them have disappeared as higher forms of life crowded them out, but there are still about 4,000 kinds of ferns. Some of them are rock ferns, almost as small as mosses; some are as big as trees. Away back in the remote period that geologists call the Carboniferous Age, the giant tree ferns and their near relatives formed vast forests covering a large part of the earth's surface, and it is their remains that make up the bulk of our coal deposits.



Fern "fronds" or leaves begin as little curled-up balls. At the proper time they unroll and spread out in leaf form. The fronds shown here are from the bracken.

varieties, they wither very quickly after being picked.

Ferns are widely distributed over the world and are of many different habits of growth. Some are but a few inches high, like the little ebony fern, or ebony spleenwort, of damp and rocky ravines and gorges. The tree ferns, chiefly inhabiting tropical countries, tower upwards 30 or 40 feet, and the crowns or leafy portions are immense clusters of fronds, some of which reach a length of 15 feet and more. While most ferns grow on the ground, there is a peculiar group, known as "epiphytes," which lives fastened upon the surface of the trunk or branches of trees (see Air Plants).

The fern does not grow from seeds as do the higher plants, but from spores.

These spores are very minute dustlike grains, each one a single plant cell, produced by one of the fronds of

A "FOREST" OF GRACEFUL FERNS



This picture in the interior of a greenhouse will give you an idea of the amazing variety of form and size found among Ferns. Being shade-loving plants they thrive in dense clusters like these. The decorative effect of their lace-like fronds is unsurpassed among plants, and this, combined with the hardy constitutions that most of them possess, makes them favorites of the household and greenhouse.

the adult fern, and scattered about by the wind. When a spore falls in a favorable situation it grows into a curious little flat green body known as the "prothallus" (meaning "before the plant"). In the prothallus grow little cases containing eggs and others containing very tiny movable bodies called sperms. The sperms are able to swim by means of a little hairlike projection upon one end of the body, and they swim to the eggs at some time when the prothallus is covered with a thin film of water and fertilize them. From these fertilized eggs grow the large fern plants. Botanists call the prothallus the "gametophyte," and the familiar fern plant the "sporophyte." So the life history of a fern plant may be summarized thus: Ferns produce spores; spores produce prothalli; in prothalli grow eggs and sperms; sperms fertilize eggs; fertilized eggs grow into large fern plants again. (See Seeds and Spores.)

Fern fronds unroll as they grow. In the spring we see them as hairy brownish-green balls clustered together on the ground. As the season advances the balls are raised off the ground and begin to unroll

Some common ferns are the *royal*, the *cinnamon*, and the tall *swamp ferns*: the *maidenhair fern*, with its dark brown polished stems and its tiny leaflets; the *rock fern*, a very hardy fern, growing on rocks; and the *hay-scented boulder fern*, common in stony pastures. The term "brake" or "bracken" is applied to the masses of tall coarse fern which grow profusely in neglected meadows and open woodland of the northern United States and in Europe.

In some places the coarse brakes are used as bedding for animals; and in Hawaii cushions and mattresses are stuffed with the silky hairlike fibers, called *pulu*, of certain tree-ferns. The rootstock of a New Zealand species serves as food, and elsewhere bitter rootstocks of ferns are employed in

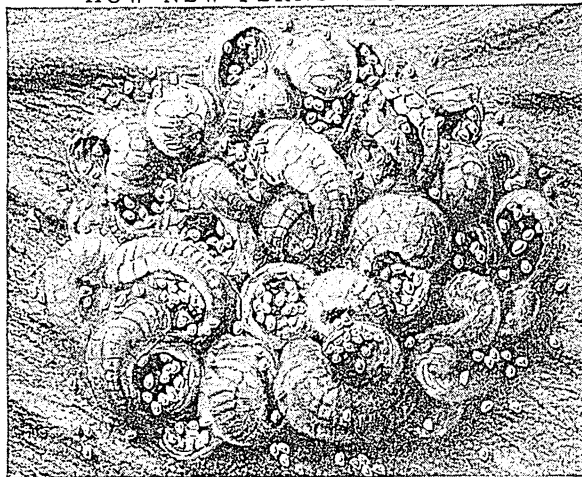
dressing certain leathers, and as a substitute for hops in beer. The male fern also is used in medicine. Ferns belong to the order *Filicales* of the division *Pteridophyta*. This latter also includes the horse-tails or scouring rushes, the quillworts, and the club mosses, of which the creeping ground pine is a familiar example. (See Rushes.)

FERRET. The black-footed ferret, the largest of the North American weasels, is found on the great plains from western North Dakota and northern Montana southward to Texas. Here it preys upon prairie dogs, other small mammals, and birds, showing the same insatiable appetite for warm-blooded animals as do all other members of the weasel family.

The slender little quadruped used to drive rabbits out of their holes in rabbit-hunting, and also to kill rats and mice, is a domesticated breed of the Old World polecat. Even though raised in confinement it never becomes really tame or trustworthy, and will make sad havoc in a poultry yard. The ferret frequently is an albino, with yellowish-white fur and pink eyes; but there is also a brown breed. The body length is about 14 inches, with a tail of $5\frac{1}{2}$ inches.

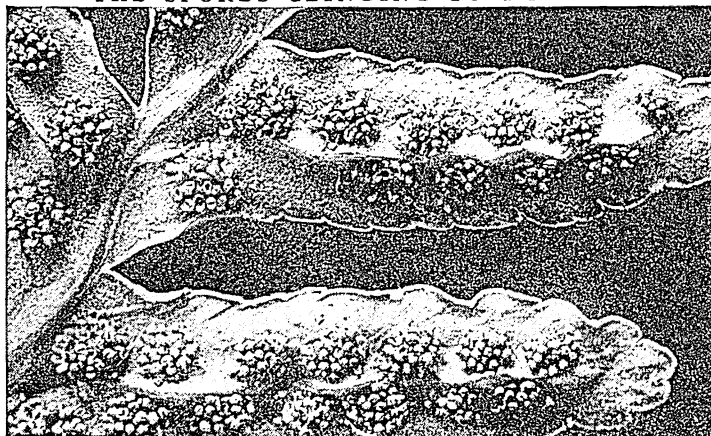
When used in hunting rabbits the ferret is provided with a muzzle or "cope," which keeps him from killing the prey. If this were not done the ferret would kill the rabbit, gorge himself, and then go to sleep in the rabbit's burrow. (See Weasel.)

HOW NEW FERNS BEGIN LIFE



Fern spores, from which new ferns grow, are contained in little cases on the under side of the leaves. Around the middle of the case is a rib-like structure which breaks and springs open, ripping the wall and scattering the spores.

THE SPORES CLINGING TO THE LEAF



Underneath the leaf the little cases containing the growing spores find shelter. After the spores are scattered by the wind they grow into "gametophytes." The gametophytes finally produce the fertilized "eggs" which in turn grow into the real ferns. Thus fern reproduction is a "two-cycle" process.

until in the later summer the full frond is revealed. In the autumn they turn red, yellow, or brown, and then fall and decay, as do the leaves of the trees. The hardy Christmas fern is an exception, for it remains green throughout the winter.

FERTILIZERS. When soils lack certain chemicals necessary to plant growth, the farmer or gardener supplies these plant foods in the form of fertilizers.

Plants that grow wild have to get their own food. In the spring they send out roots in search of food, and in the autumn they shed their leaves or die from the cold. Their dead leaves and stems soon decay, thus returning to the earth the food they used. That is why wild plants can grow without fertilizer.

Now consider what happens to the plants that man grows for his own use, such as wheat and potatoes, grown for food; cotton, for clothing; and clover and alfalfa, for cattle feed. When the crops are ripe they are carefully harvested and with them go most of the plant food they have taken from the soil. Where is next year's crop going to obtain its food?

Unless man puts back into the soil the plant food taken away in the harvested crop the soil becomes impoverished so that his crops become poorer and poorer, until he has a run-down farm. That is why the wise farmer is careful to save stable manure, well rotted straw and leaves (called "compost"), wood ashes, and other waste materials, for they contain at least a part of the plant food taken from the soil. These are called *natural fertilizers*.

Plants Should be Strictly Dieted

The growing plant requires, it is said, 13 elements of plant food. Those that are used up in largest quantity must be put back into the soil in largest quantity. These are principally nitrogen, phosphorus, and potash. Commercial fertilizers therefore contain these three foods. Lime is also frequently required to overcome soil acidity, for many plants do not flourish in an acid soil.

The farmer should understand the food requirements of his crops. Nitrogen produces a large vigorous plant, while phosphorus and potash give strength to the plant and enable it to bear abundant fruit.

Nitrogen comes in the form of ammonium sulphate, a by-product of coke manufacture; or sodium nitrate,

formerly obtained exclusively from the great natural nitrate deposits of Chile, but now manufactured in large quantities from the nitrogen of the air; or cottonseed meal, the residue left after the oil is extracted from cottonseed; or animal products, such as dried blood, tankage (by-products of the meat-packing industry), and fish meal prepared from non-edible fish and the waste from fish canneries. Ammonium sulphate, however, is used in largest quantity, for it is cheap, and so rich in nitrogen that a 100-pound bag contains as much nitrogen as two tons of stable manure. (*See Nitrogen.*)

Phosphate and Potash Fertilizers

Phosphorus, in the form of calcium phosphate, is obtained from natural deposits of phosphate rock, principally in Florida and Tennessee. To render the phosphate more digestible for the plant, the rock is ground and treated with sulphuric acid to form "super-phosphate." This is the principal constituent of most commercial fertilizers.

Potash is largely imported from Germany and France, where most of the world's potash is produced (*see Potassium*). The United States, however, has deposits of its own, from one of which, Searles Lake in California, large quantities of high-grade potash are now being produced.

The manufacturer grinds these raw materials to powder, mixes them in the right proportions, and packs them in bags. On each bag he places a tag or label showing exactly how much nitrogen (N), phosphorus (P_2O_5), and potash (K_2O) the mixture contains.

American farmers use seven and one-half million tons of commercial fertilizers yearly—enough, if packed in 100-pound bags, to make a double row around the world. The farmer expects to obtain on one acre fertilized as large a crop as he would obtain from two or three acres unfertilized. This means he has less work to do per unit of crop raised. So, fertilizers increase profits, save labor, and most important of all, preserve the fertility of the soil.

LORDS and VASSALS—*The Feudal Age in EUROPE*

FEUDALISM. If one could travel over western Europe as it was a thousand years ago, one would see a succession of woods and farms, farm villages with clusters of houses, gloomy castles, a few walled towns, and now and then a well-protected monastery. Dominating the landscape were castles, the fortified homes of the powerful feudal barons. They controlled the land, which was then the principal source of wealth. Most of the people who tilled the soil and many of the traders and craftsmen in the towns were serfs and villeins, bound to the land, and governed by the landlords, to whom they owed labor as well as taxes.

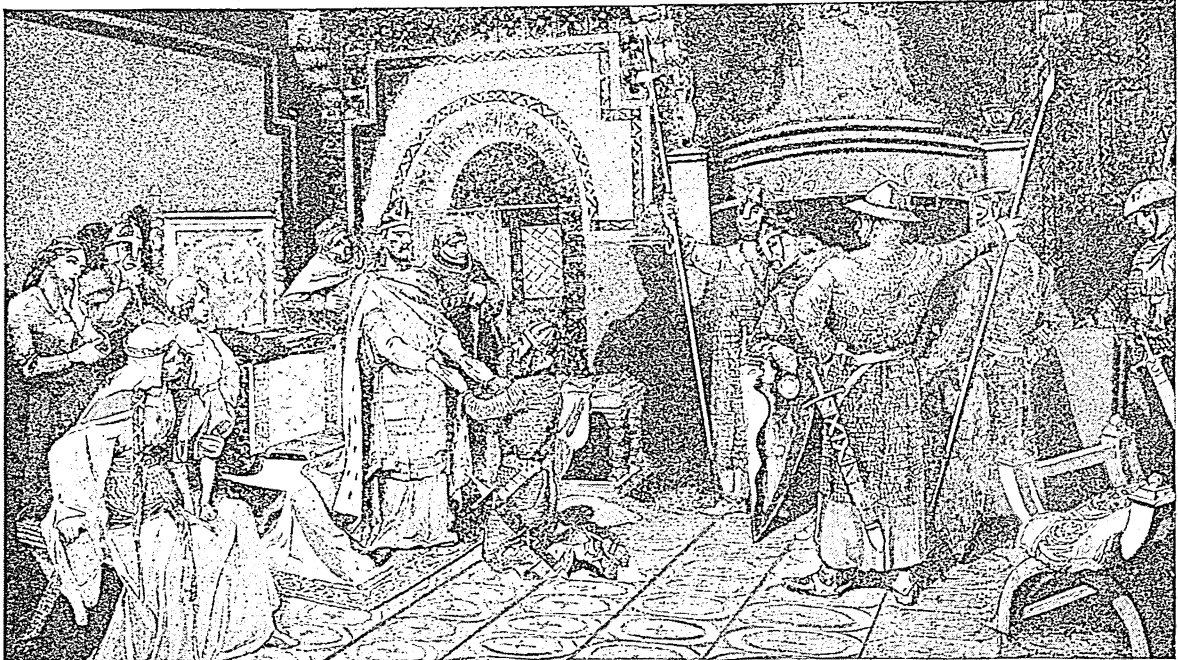
Origin of Feudalism

How did these peculiar arrangements come about? To understand their beginnings, we must go back to the break-up of the ancient Roman Empire. During the barbarian invasions, beginning in the last part of

the 4th century A.D., indescribable confusion prevailed. For a time, it seemed likely that the Roman authority was to be restored by the Franks, whose great king, Charlemagne, was crowned emperor of the Romans in 800. Again, however, the central government was broken up by invading barbarians. Northmen from Scandinavia, who were expert seamen as well as warriors, moved swiftly in their small boats along the coasts into the harbors, and far up the rivers. Here today, yonder tomorrow, without warning they attacked, and without mercy killed and pillaged. (*See Northmen.*)

The government of the empire was helpless to defend the people. Even if the place of attack could be discovered in advance, soldiers of the emperor could not move from place to place quickly enough to help. Internal difficulties also weakened the central

A VASSAL "DOING HOMAGE" IN FEUDAL DAYS



Here is a vassal kneeling before his feudal lord, with both his hands placed in those of his lord. He says, "Sire, I become your man from this day forth, of life and limb, and will hold faith to you for the lands I claim to hold from you; and I will serve you in all ways that a free man should." Then the lord raises him to his feet, and the vassal swears his "oath of fealty," after which the lord "invests" him with, or puts him in possession of, his "fief" by handing him that lance which the nearest man-at-arms holds. In return for his fief the vassal performed military service for his lord. Notice the helmets and coats-of-mail worn in this picture, and also the furnishings of the lord's great hall, especially the hooded fireplace in the background.

government. Since the all-important problem of the times was that of defense against the invaders, any landlord who was enterprising in repelling their attacks or fortunate in escaping their ravages was regarded as the natural leader or protector of the community. Sometimes he took advantage of his power to gain control of the lands of his neighbors. Smaller landowners usually gave up title to their lands but continued to use them. As a result, a new set of customs arose that determined the relations between the different classes.

Local landlords were still regarded as subjects of the central government, whether headed by a king, as in France, or by an emperor, as in Germany. In feudal terms they were called *vassals* and the lords were called *suzerains*. A *fief* was a tract of land granted by the suzerain, and held by the vassal. The same person might be both suzerain and vassal. The king of England was suzerain in relation to the nobles, bishops, and abbots who held land from him in England as his vassals; but in France, he held land as the vassal of the king of France. A nobleman who had a large tract of land might divide it and grant portions to vassals, and thus he would be vassal of the king but suzerain of those to whom he granted fiefs.

Elements of Feudalism

Feudal customs were determined by three main ideas. One of these concerned the basic form of property, the fief. It grew out of the *beneficium*, a form of landholding in which the owner gave his land to

some greater landlord, to the church, or to the king, with the understanding that he would receive from the new owner the right to use the land. Title to the fief became hereditary. Usually it went to the oldest son in accordance with the law of *primogeniture*—the right of the eldest son to inherit all the land.

The second controlling idea in feudalism determined the personal relations between suzerain and vassal. In the early Feudal Age, when a smaller landlord gave up title to his land in return for protection from the dangers of the age, the process became known as *commendation*. The lesser man became his lord's man and promised loyalty. Thus there grew up one of the most distinctive ceremonies of the Feudal Age—*homage*. By this ceremony (which got its name from the Latin word *homo*, meaning "man") the lesser lord became the man or vassal of his overlord or suzerain to whom he swore fealty. He agreed to fight for his lord, to furnish soldiers in proportion to the size of his fief, and to give "aids" in money on special occasions, such as the knighting of the lord's eldest son and the marriage of his eldest daughter. Protection was viewed as the chief obligation of the suzerain; and personal loyalty, expressed particularly in the duty to fight for his suzerain, was the main obligation of the vassal.

The third basic idea in feudalism determined the government. The powers of the feudal lords, like their personal relations and their peculiar land titles, grew out of older customs and institutions. One of these

was known as *immunity*. As the difficulty of maintaining strong central governments increased, kings and emperors depended more and more on vassals to maintain order, and often granted them freedom, or "immunity," from the central authority. Immunity was sometimes secured by purchase. Often during the confusion of the invasions and the break-up of Charlemagne's empire, landlords became independent and governed their estates as self-sufficing rulers without formal grants of immunity. They maintained soldiers, collected revenues, held courts, and even coined money. Most people knew little of government except that of their landlords.

The church owned great tracts of land, and so churchmen became vassals of emperors, kings, and barons. This feudalizing of church lands caused churchmen to occupy a two-fold position. As vassals, they owed allegiance and feudal obligations to their suzerains, the kings and emperors. But they were also officials of the church, and they recognized the pope as the supreme authority. The pope held that kings and emperors must not tax the church, must not try to control appointments and must not require of churchmen homage or fealty. The resulting clash continued beyond the age of feudalism, being echoed in the dispute of Italy and the Vatican (see Papacy).

Feudalism in the narrow sense was limited to the fief and the system of land tenure associated with it, to the personal relations of vassals and suzerains, and to the immunities and governmental powers of the lords. The peasants were the serfs and the villeins. The distinction between the two classes is hard to establish. They usually lived in villages or manors, with several hundred acres of land. Their huts were mostly made of rough timbers, and the cracks were chinked with mud, straw, or rubbish. The roofs were usually thatched. The fireplace was simply an open space near the center, with no chimney. The floor was strewn with straw, leaves, rushes, or rubbish. There were few furnishings and utensils. If the owner lived

on the manor, he had a large house with inclosed gardens and fields. Usually there was also a church with a priest's house. Somewhere about the manor one would find a mill, a forge or crude blacksmith's shop, and a bakehouse.

The lands of the manor included woodland and pasture as well as fields. There were usually three fields. Each field was divided into strips, and each peasant had the right to cultivate a number of strips in different parts of the manor (see Agriculture). The part of the land that the lord of the manor kept for

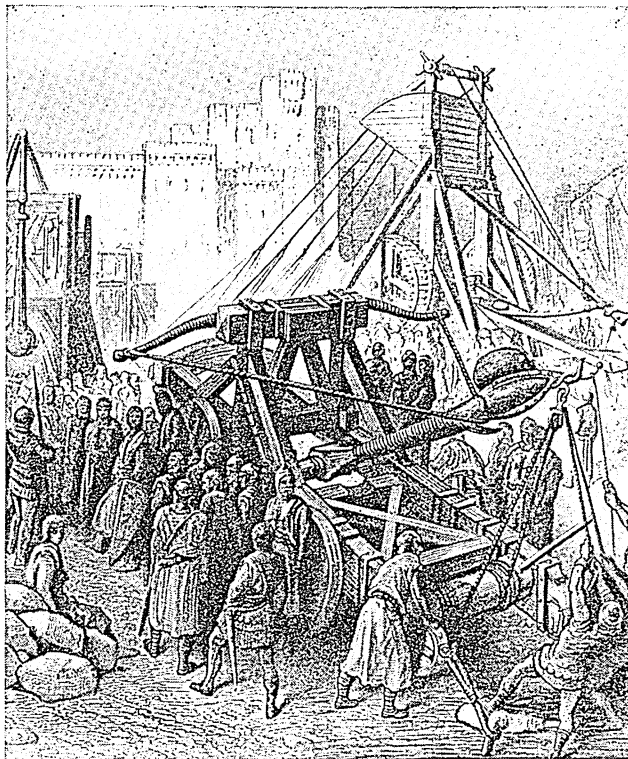
his own use was cultivated by the peasants in return for the right to till their own strips. In contrast with the vassals, who owed only military or "noble" services to their suzerains, the villeins and serfs had to serve the lord of the manor by doing various kinds of menial work and by turning over to the lord a large part of their crops (see Slavery and Serfdom).

The village was almost entirely self-sustaining. Salt, millstones, and a few iron tools and utensils were brought in, but nearly all the clothing, shoes, tools, building materials, and furniture were made by craftsmen who lived about the castle. Disputes between villagers were settled by the lord of the manor or his agent or by the village court. Villagers rarely went many miles beyond their place of

birth. The castle folk lived in a different world. They had to depend to a large extent on local resources, but they had the best of everything and came into touch with the larger world. Tradesmen brought in the finer goods that were made in the larger towns, and also the spices, jewels, and silks imported from distant eastern countries.

The castle was not only a home, but also a fortress, a prison, a storehouse, and a workshop of arts and crafts. It was also the capital from which the lord of the castle governed his barony—the various villages, markets, and perhaps towns that made up his estates. The lord of the castle collected the surplus wealth of his dependents, and the castle folk spent it. In the

BOMBARDING A SARACEN STRONGHOLD



Before gunpowder came into use, machines of various kinds served as artillery, throwing stones, javelins, and other missiles. The machine in the foreground here is a *catapult* or *ballista* of the crossbow type. The cord connecting the arms of the huge bow is stretched by a windlass. When it is let go, the stone resting in the hollow of the hinged lever is shot forward with tremendous force. The ballista was more commonly used to hurl javelins than stones.

neighborhood of some of the castles, markets and fairs were held; and occasionally towns grew up about them. (See Castle.)

For the young people of the aristocracy a system of training, known as chivalry, took the place of school and college. It had very little to do, however, with intellectual life, and was for the purpose of giving children, especially boys, training in horsemanship, the handling of weapons, and social usages. It gave rise to the idea of the gentleman in the narrow sense as a member of the landed aristocracy. It taught that a gentleman should protect the weak of his own class, should be courteous to women of equal rank, and loyal within the limits of his own social group. Limited as they were, the ideals of chivalry somewhat counteracted the violence and brutality of an age of perpetual conflicts. (See Knighthood.)

Feudalism was essentially a method of organizing local defenses. The privileges of feudal lords were in origin a reward for their assuming the responsibilities of fighting and governing during a period when the central government failed to meet the needs of the people. However, once having secured their privileges of owning the land and of taxing the peasants, they built up a system of customs, laws, and social relations which endured long after the period of invasions and disorder.

Why Feudalism Passed Away

But various forces were slowly working against feudalism. After the 13th century they brought about its decline in one country after another. In western Europe, the kings, especially in France and England, were important factors in its overthrow. During the Feudal Age, they depended for their soldiers, their officials, and their revenues mainly on their vassals. Hence, there was almost continuous conflict between kings and vassals—a conflict that is illustrated by the case of King John in England. When he tried to interpret feudal customs in his own favor, the vassals united against him, and in 1215 forced him to sign the Great Charter, which defined and limited the powers of the king over his vassals (see Magna Carta). After Edward I and later kings secured the support of the rising middle classes and commoners, feudalism as a system of government in England was doomed.

As a military system, feudalism broke down because of two innovations. One was gunpowder, which rendered castles and armor useless (see Gunpowder). The

other was the national standing armies of non-feudal soldiers built up by the kings.

Furthermore, the feudal lords were extravagant, and careless in maintaining the productivity of their estates. They spent vast sums on the Crusades, and in various other ways their wealth passed into the hands of merchants and craftsmen. The age of agriculture, on which feudalism depended, began to yield to the age of commerce. Towns and cities grew in importance and power, and gradually wrested privileges and liberties from the feudal nobles.

By the beginning of the 14th century these and other changes had undermined the foundation of the feudal system, and national governments were beginning to take its place. (See also Middle Ages.)

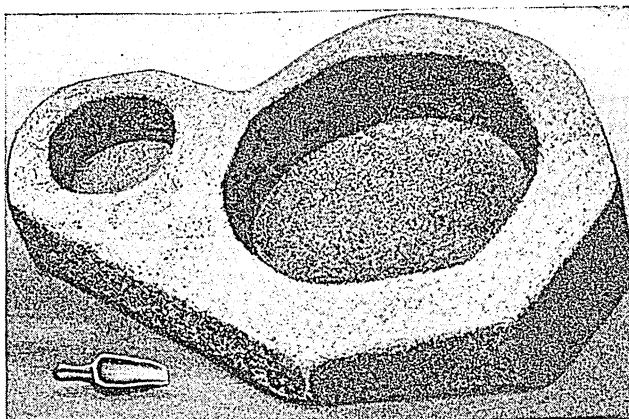
FIBERS. If man hadn't long ago discovered how to weave fibers

into cloth, we would still be wearing skins. We need fibers also to make yarn, thread, rope, twine, rugs, mats, paper, brushes, and hats; to stuff pillows and mattresses; and to make chemical compounds. The most important *animal* fibers are wool, from sheep; silk, from the silkworm; and the hair of the horse, goat, rabbit, alpaca, vicuña, cow, camel, and of man. The chief fibers of *vegetable* origin are cotton, and more recently wood, from which most rayon is made. Other vegetable fibers are kapok, a silky resilient fiber from the pods of trees grown in the tropics, which is used to stuff mattresses, pillows, and life preservers; flax; hemp; jute; pineapple; sisal; henequen; istle or Tampico fiber, and other varieties of agave; abaca or manila hemp; Sunn hemp; maguey; straw; ramie or China grass; mulberry; yucca; wood; Spanish moss; rushes; esparto, bamboo, and other grasses; and various palm fibers such as kitool, raffia, piassava, crin vegetal, palmetto, and coir or coconut. Fibers of *mineral* origin include gold and other metallic fibers and asbestos.

Besides these natural fibers we now have various *synthetic* fibers. Among them are rayon; fiberglass, or spun glass; nylon, made from coal, air, and water; vinyon, derived from coal or natural gas, salt, and water; lanital, an artificial wool made from casein; and lastex fiber, a rubber thread wrapped with cotton, wool, or silk. (See Plastics; Rayon.)

FIELD, EUGENE (1850-1895). Journalist, humorist, and writer of delightful verse for and about children, Eugene Field was also a collector. He collected rare and beautiful books, objects of artistic workmanship, and curios. But he also kept about him and cherished from sentiment absurd and worthless things, as

HOW THE LORD'S SHARE WAS MEASURED



This great stone, preserved in the Chateau de Tournol, in Auvergne, France, is called the "measure of the tithe." It was used to divide a peasant's grain with his feudal lord. Each of the cavities was filled in turn, the smaller measure (one-tenth) going to the lord, the larger (nine-tenths) to the peasant. This seems to have been the usual ratio.

a mother keeps the little worn shoes of a baby. Among all those treasures of literature and art, he displayed with loving pride the battered outgrown toys of his seven children who were the joy of his life. Tarnished trumpets and broken drums, torn balls and stringless tops, dismembered animals, "spinster dolls," paintless blocks, wrecked sailboats, and dog-eared picture books were tucked away in odd corners; and on his desk at times stood a shorn lamb, a china dog with a broken nose, or a "little tin soldier red with rust." And it was from these that the Poet Laureate of Childhood drew inspiration for his 'Little Boy Blue' and other poems that made his name a household word in America.

Born in St. Louis, but of New England ancestry, Eugene Field combined the best qualities of East and West. His early years were spent in Massachusetts and he was educated at Williams College (Massachusetts), Knox College (Illinois), and the University of Michigan. Then he was employed on newspapers in St. Louis, Kansas City, and Denver before he found a permanent berth, and the leisure to do his distinctive kind of work, on the *Chicago Daily News*. His scholarly and graceful translations from the Latin poet Horace, and his prose tales and sketches, marked by a learning, sentiment, and humor that recalled Charles Lamb and Oliver Wendell Holmes, would alone have won for him a distinguished place in American letters.

But all his other work was eclipsed by the poems in which he expressed the beauty, innocence, appeal, whimsicalities, and bubbling fun of childhood. The charming simplicity and spontaneity of his juvenile verse, with its sympathetic insight into the shy little minds and hearts of children, have not been surpassed even by Stevenson and Riley. Several of his cradle songs have been set to music.

No sketch of Eugene Field would be complete without reference to the testimony of numerous devoted friends that the man himself was as fine and rare in quality as anything he wrote. Fortune had given him the mobile face that made him the ideal entertainer in the social circle and on the lecture platform; and his mind, in its infinite variety of wit, wisdom, mirth, and sentiment, was like that of a court jester of knightly days. It was a matter for



EUGENE FIELD
Poet of Childhood

wide personal grief, as well as a public loss, when this gifted poet died at the early age of 45, before his own brood of little children was grown up.

Eugene Field's works include: 'A Little Book of Western Verse' (1889); 'A Little Book of Profitable Tales' (1889); 'With Trumpet and Drum' (1892); 'Echoes from a Sabine Farm' (translations from Horace), 1893; 'Love Songs of Childhood' (1894); and, in collaboration with his brother Roswell Field, 'Love Affairs of a Bibliomaniac' (1896).

FIGS. Every time you eat a Smyrna fig you owe thanks to the fig-wasp, for without this tiny insect no bigger than a gnat we would have none of those luscious fruits, which from the earliest times have been the best figs in the world, whether fresh or dried.

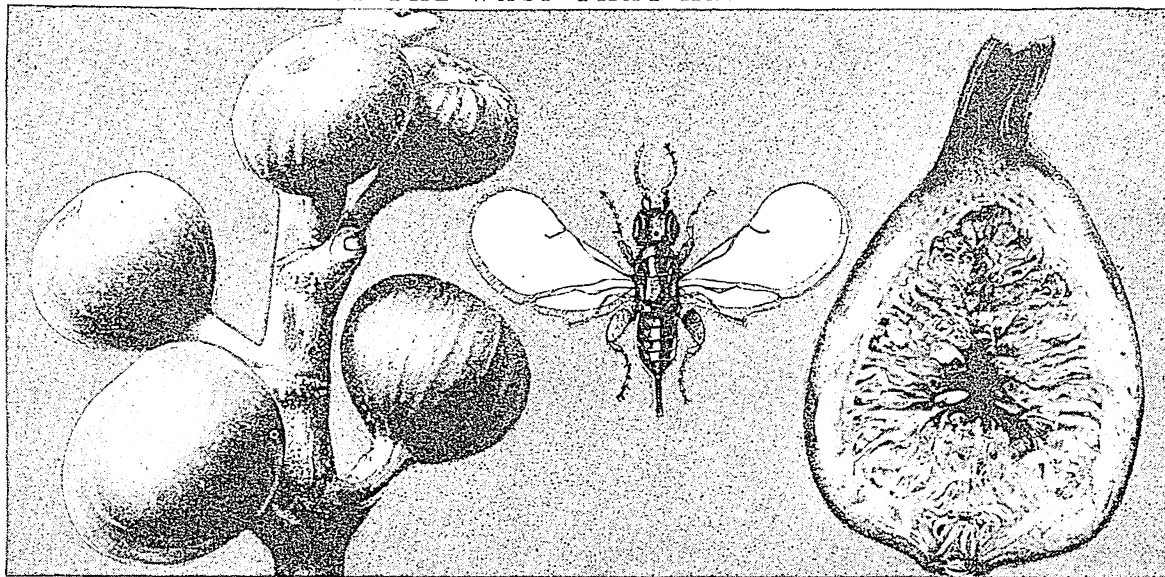
The part these little wasps play in the life of the Smyrna fig is in aiding cross-pollination. The buds cannot develop unless they are fertilized by the pollen of the caprifig, a wild species that bears only sour and pithy fruit. This is due to a peculiarity in the structure of the Smyrna fig. The luscious pear-shaped figs, full of delicious pulp, are not the true fruit of the tree. They are rather the receptacles within which the little fig-flowers grow and ripen in great numbers, forming the true fruits, which we commonly call the "seeds." This receptacle is closed save for a little hole at the very tip, so that cross-pollination cannot be accomplished in the usual way—by the wind or by ordinary insects.

The fig-wasps breed in the fruit of the wild fig. At the proper time bunches of these wild figs are hung in the tops of the cultivated trees, and when the little wasps push out to find a place to lay their eggs, their bodies become covered with the pollen from the wild-fig flowers. As they enter the Smyrna fig, this pollen is brushed off on the flowers and fertilizes them. This process is called "caprification." One caprifig tree is sufficient to pollinate 100 cultivated trees.

Though figs have long been grown in the warmer parts of the United States, there was no fig-growing industry until a few years ago. Then Smyrna fig trees were brought to California for cultivation on a large scale. For years there were heavy financial losses and great disappointment, for the fruit did not ripen properly. Men of science were sent to Asia Minor to study the tree in its native home, and there discovered the important part the fig-wasp plays. So caprifig trees were planted, and little fig-wasps were carefully packed and brought across thousands of miles to the California groves. Now the figs of California rival those of Smyrna, and the drying of figs has grown to be commercially important.

There are many varieties of fig which do not require cross-pollination, but their fruit is not so delicious and cannot be dried so easily and well as the Smyrna fig. The different species vary greatly, some being low trailing vines, and others good-sized trees. The fruits vary in color from deep purple to yellow or nearly white. The Smyrna fig is a small bushy tree and rarely grows more than 18 or 20 feet high. The India-rubber tree (*Ficus elastica*), from which most of the East India rubber comes, is a species of fig.

STORY OF THE WASP THAT HELPS MAKE FIGS



Have you ever noticed the rounded hole in the end of a Smyrna fig? Its existence enables Nature, with the aid of the tiny fig-wasp here shown (considerably enlarged), to perform one of her most unusual bits of magic. The Smyrna fig does not ripen unless it is provided with pollen from the caprifig. The little wasps grow to maturity in the caprifig fruit, then crawl through the hole into the Smyrna fig and deposit inside of it the pollen that clings to their bodies. Thereupon the fig ripens into the delicious fruit we all love.

As far back as history goes, the fig has been a house-yard tree. "Beneath the vine and fig-tree" is used more than once in the Old Testament to designate "home." For centuries the fruit, fresh or dried, has made up a large part of the food of the natives of western Asia and southern Europe. Its juice is used to make a drink and also to dye cloth; its leaves are used to polish ivory and the bark to make cord.

In favorable climates the fig tree produces two and sometimes three crops of fruit a year, on distinct shoots. The trees grow readily from cuttings, and are also propagated by budding, grafting, and seeds. The large beautiful leaves are deciduous, palmately veined, three- to five-lobed, wavy-margined, and somewhat rough and leathery.

Scientific name of the edible fig, *Ficus carica*. The four chief varieties are *syvestris*, *smyrniaca*, *hortensis*, and *intermedia*. The *syvestris* is the all-important wild fig or caprifig, in which the little fig-wasps (*Blastophaga grossorum*) breed. The *smyrniaca* is the best of all figs. The *hortensis* variety includes all the self-fertilizing table figs. The *intermedia* can mature one crop without pollination.

FIGURES OF SPEECH. When you say that the athlete "ran like lightning," that someone who talks too much is a "windbag," or that you are "dying with curiosity," you are using figures of speech. You are saying things which are not strictly true, but which make your descriptions more vivid than literal expressions could be. Another name for figure of speech is *trope*, the Greek word for "turning"—a turning of words from their usual meaning or order for the purpose of clearness, emphasis, or beauty.

Figures That Show Comparison

Two of the most familiar figures of speech are the *simile* and the *metaphor*. A simile is a figure of

speech in which comparison between two entirely different objects is expressed by the use of such words as *like*, *as*, and *so*. Wordsworth uses a beautiful simile when he says of Milton: "Thy soul was like a star and dwelt apart." This figure gives us a vivid impression, in few words, of Milton's loftiness of spirit and his love of solitude.

In a metaphor, the comparison is implied, rather than expressed. Here the connecting word *like*, *as*, or *so* is not used; we simply say that one object is another—for example, "His head is a sieve." Shakespeare uses a metaphor when he says,

All the world's a stage,
And all the men and women merely players.

Metaphors are more forceful than similes, but they must be used carefully. Otherwise we run the risk of becoming involved in *mixed metaphors*. Here the figurative language, instead of going on with the picture which the comparison calls up, leads into an entirely different and ridiculous idea—for example, "The pale hand of death stalked into our midst."

Another figure that uses comparison is *personification*—giving human characteristics to an inanimate object. Thus "AE" tells us: "Dusk wraps the village in its dim caress," and Byron says, "Lake Leman woos me with its crystal face."

Exaggeration and Understatement

When we exaggerate to produce a vivid impression, we use *hyperbole*. This figure is often used unconsciously in everyday speech. We say we have not seen a friend "for ages," or that an unhappy person wept "buckets of tears." Hyperbole is a chief characteristic in American humor. Washington Irving uses it effectively in picturing Ichabod Crane with "hands that

dangled a mile out of his sleeves" and "feet that might have served for shovels."

Understatement, the opposite of exaggeration, is also used for special effect—to make a statement more emphatic by deliberately weakening or minimizing it. The commonest form, technically called *litotes*, is the use of the negative to emphasize a positive statement—for example, "That's not a bad idea" or "He is nobody's fool." Other forms of understatement (*meiosis*) are frequent in colloquial speech, as "the late unpleasantness in Europe" (the World War of 1914–1918) and "crossing the pond" (the Atlantic). Mark Twain is especially noted for such understatements.

Other Figures of Speech

There are many other figures of speech (also called "figures of rhetoric") used for various rhetorical effects. These include *antithesis*, *irony*, *euphemism*, *epigram*, *metonymy*, *synecdoche*, *allegory*, *climax*, and *onomatopoeia*. All of these, with definitions and illustrations, may be found under their own names in the Fact-Index.

Figures of etymology are contractions or elisions, such as *ne'er* for *never* and *'twill* for *it will*. Figures of syntax are deviations from normal sentence structure, such as the use of words out of their regular order, as "We climbed a mountain high," and the omission of words to gain force, as for example, "On guard," for "Be on your guard."

FIJI (*fē'jē*) ISLANDS. Gleaming white buildings, the whirl of motor cars, and the bustle of a busy port greet the visitor who disembarks at Suva, capital of Fiji. This group of South Sea islands, once infamous as a home of cannibals, is now a progressive and law-abiding crown colony of Great Britain.

The Fiji group is about 600 miles southwest of Samoa and 1,150 miles north of New Zealand. It is composed of about 250 islands, only 80 of which are inhabited. The larger islands are of volcanic origin; the smaller ones are coral atolls. The largest, Viti Levu, on which Suva is situated, is 98 miles long and 67 miles wide; the next in size is Vanua Levu, 117 by 30 miles. On Viti Levu, as on the other larger islands, the coast hills—vividly green with huge vine-wrapped trees and great reeds—rise to rugged peaks, often more than 3,000 feet high. Many rivers, often swollen by torrential rains, cut the fertile valleys. The chief river, the Rewa on Viti Levu, is navigable for about 50 miles. For the tropics, the climate is cool, with temperatures ranging from about 60° to 95°F.

The discovery of Fiji is usually credited to Abel Jansen Tasman, a Dutch navigator, who visited the

group in 1643. For almost two centuries vessels fearfully avoided the beautiful islands which thundered with the roll of cannibal drums. But in 1835 missionaries began the work of civilization, and much of the progress made by the natives is due to their labors. In 1874 Thakombau, famous "King of the Cannibal Islands," who had been converted to Christianity by the missionaries, put Fiji under British rule. Although occasional cannibal feasts occurred as late as 1890, the missionaries and the British soon made Fiji commercially one of the most important of the Pacific island groups.

Character of the People

The Fijians are tall, bronzed, and strongly-built, with frizzy mops of black hair. They are a childlike people—gay, gentle, and almost without ambition. They live in a placid communal society. Every Fijian has a right to a piece of the land belonging to his tribe. He is content to support his family by his little crops. Large tasks, such as building the thatched huts, are done by the village as a whole. Under the strict medical care of the British, the natives have increased in population—a rare happening on Pacific isles that have been exposed to the diseases of white men. Free medical service, numerous schools, including a medical school, and a child welfare program have been established by the government.

The chief export is cane sugar. Production is controlled by a British refining company which leases land to growers, chiefly East Indians. Other major exports are copra, molasses, bananas, shells for buttons, and gold bullion. Minor exports are coconut oil, gum, trepang (smoked sea-cucumbers), cotton, and turtle shell. The discovery of new gold deposits in 1935 greatly increased the export of bullion.

Fijians produce most of the copra and bananas but refuse to labor steadily at other work. The British, therefore, imported Chinese and Indian coolies. Of the total population of more than 200,000, East Indians number about 86,000; Fijians about 100,000; Europeans about 5,000. The rest are mainly Chinese and Polynesians.

Fiji is ruled by a British governor and a legislative council consisting of British, Indian, and Fijian members. The governor is also British high commissioner for the Western Pacific. The district councils are made up of tribal chiefs and village headmen.

The Thirteenth PRESIDENT of the UNITED STATES

FILLMORE, MILLARD (1800–1874). Upon the death of President Zachary Taylor in 1850, Millard Fillmore, his vice-president, succeeded him in office. The period was a stormy one, for a bitter debate on the slavery question was raging. A hostile Congress handicapped Fillmore's able and conscientious efforts, and his policies were not popular enough with the people to win him a second term.

Fillmore was born in a log cabin on a frontier farm in Cayuga County, N. Y. When he was 14 years old,

his father apprenticed him for seven years to a wool carder, who proved to be a brutally cruel master. Two years before his term of apprenticeship was finished, Fillmore decided to study law. So he "bought his time" for \$30, and went to Buffalo. There he persuaded a lawyer to let him work in his office for room and board. To earn money for other expenses he taught school, although his own formal schooling had ended when he was 14, and had been limited to three months each year.

After eight years in a law office he was admitted to the bar in 1827, and began the practice of law at Aurora, N.Y. He returned to Buffalo in a few years, and by 1840 his law firm was one of the best known in the state. Though Fillmore was never a brilliant lawyer, he was a conscientious worker and had a sound legal knowledge.

His political career began with the birth of the Whig party, to oppose the Democratic party of Andrew Jackson, and it ended with the death of that party on the eve of the Civil War.

The first time he was elected to office was in 1828, when he was chosen a member of the New York legislature; the last was in 1848, when he was elected vice-president of the United States.

Fillmore's Record in Public Life

In the legislature Fillmore's chief service was in securing the passage of a law to abolish imprisonment for debt in that state. In Congress, where he served several terms (1833-1835, 1837-1843), he was author of the tariff law of 1842, which provided high duties on imports. To him also was due the appropriation by Congress of \$30,000 to aid Samuel F. B. Morse in perfecting his invention of the telegraph. On the burning question of slavery he pursued a moderate course, keeping free from pledges to either side. This made him acceptable to both Northern and Southern Whigs, and led to his election as vice-president with Gen. Zachary Taylor in 1848.

As vice-president he was called upon to preside over the Senate during one of the stormiest debates in the history of the country, that on the slavery compromise measures of 1850. Since 1826 no vice-president had made an attempt to call the senators to order when they became too heated in debate, but during this debate Fillmore resumed the right. His position was made difficult by the fact that his attitude of concession to the slaveholding South differed from that of President Taylor.

How He Became President

In the midst of the debate Taylor died, and on July 9, 1850, Millard Fillmore became the 13th president of the United States and the second "accidental

president" who had succeeded to that office from the vice-presidency. He formed a new cabinet with Daniel Webster as secretary of state. Backed now by the President's influence, the compromise measures were soon passed and were signed by Fillmore, because he felt that only by them could the Union be preserved. (See Compromise of 1850.) His signature to the new Fugitive Slave Law, which was part of the compromise, lost him the support of the Northern members of the Whig party, and cost him reelection

in 1852. During the continuance of the slavery dispute it was impossible for any president to suit both North and South, and no president from Jackson to Lincoln served more than one term.

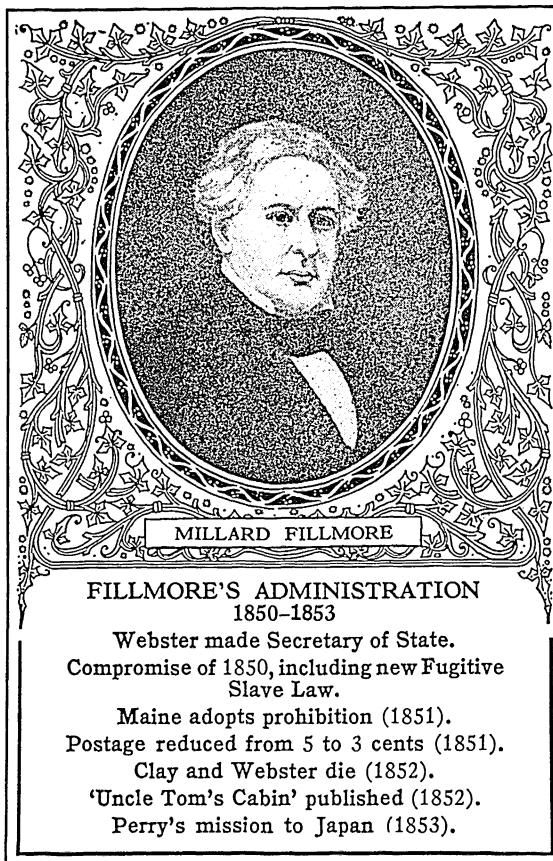
As Fillmore was a Whig and Congress was Democratic, little important legislation was passed except the compromise. But in foreign affairs an important step was taken in the despatch of an expedition under Commodore Perry to Japan. This began the negotiations for the treaty of 1854, which opened Japanese ports to American vessels and paved the way for the introduction of western civilization into that kingdom.

The great Whig leader, Henry Clay, on his deathbed had recommended that President Fillmore be renominated in 1852; and Daniel Webster said that his administration was one of the ablest that

the country had known for years. But the Southern Whigs were lukewarm, and many of the Northern ones bitterly opposed him as a "Silver Gray" or "Cotton" Whig. So he was passed by in the convention and the nomination given to General Winfield Scott, who, however, was defeated by Franklin Pierce, the Democratic candidate.

The Passing of Fillmore and the Whigs

At the next election, in 1856, the expiring Whig party, in alliance with a party called the "Know Nothings," thought better of their neglect and made Fillmore their presidential candidate; but he was badly defeated at the polls by the Democratic candidate, James Buchanan. He obtained the electoral vote of only a single state, Maryland. This was Fillmore's last appearance in public life, though he main-



tained his interest in political affairs until his death, 18 years later. His last years were spent in his luxurious home in Buffalo, in striking contrast to his boyhood days.

In spite of his lack of early advantages, President Fillmore possessed, we are told, "a grace and polish of manner which fitted him for the most refined circles of the metropolis." His sound learning is shown by the fact that when he visited England in 1855 he was offered the degree of D.C.L. (Doctor of Civil Law) by the University of Oxford, an honor which he declined.

FINCH. Twelve hundred different species of finches, scattered through the temperate and tropical countries of the world, make up the family known as *Fringillidae*, the largest of all bird families. All have the stout bill, conical in shape, with great seed-crushing power, and the 9 feathers in the hand section of the wing, with 12 tail feathers. They migrate, if at all, over but a small area, and most of the species nest on the ground or in low trees or bushes. Little harm can be said of any member of this large group, and all are valuable aids to the farmers, as they feed largely on weed seeds.

The plumage of the finches varies from the dusky colored sparrows to the vivid blues, scarlets, and yellows of the more brilliantly colored species. The vocal powers also vary, for the finch family includes along with its non-singing members such songsters as the cardinal, the grosbeak, and the goldfinch.

About 200 species of finches are found in the United States. Of these the goldfinch is one of the most common. About five inches long, the male bird is a golden yellow, with a black crown and wings (for illustration in colors see *Birds*). He and his olive green mate are found wherever dandelions and thistles seed. His habits and song are as cheery as his coat.

The indigo bunting is another popular finch. He is about the size of a goldfinch and has been described as "the bluest bird that flies." His song is one of the few to be heard in the midday heat of summer. The female is feathered in dull brown.

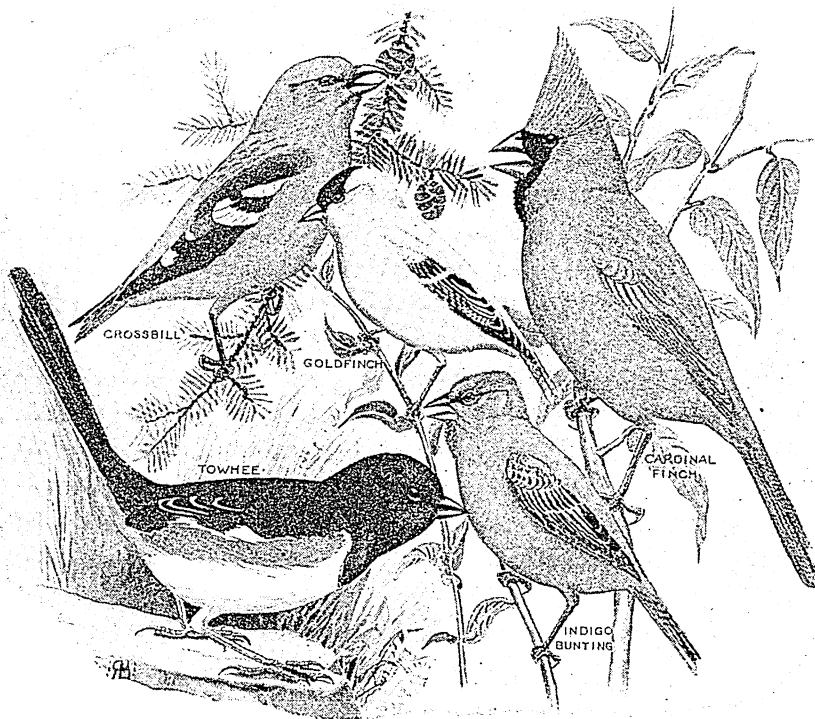
A curious finch is the crossbill, for the curved mandibles of his sharp-pointed bill cross in a way that

gives the impression of a deformity. This is really a special and very clever adaptation to the bird's feeding habits. A few quick strokes of his curious beak will cut an apple into pieces and allow the scoop-like tongue to take the seeds, which the crossbill prefers to the fruit itself.

The junco is a hardy little member of this family. He wears a trim quaker coat and a black cap and breastpiece. Though naturally shy, when winter snow covers his feeding grounds he, in company with the sparrows and chickadees, is very glad to accept man's hospitality.

Another interesting finch is the towhee, which gets its name from its call-note. It is also called a chewink, for some students of birds think the latter word more nearly represents the sounds it utters. The towhee is a skilful ventriloquist and has two other notable peculiarities—one its habit of scratching like a hen and the other its apparent unconcern when its nest is approached. When the nest is actually discovered, however, it betrays much alarm. The towhee is eight

POPULAR MEMBERS OF THE GREAT FINCH FAMILY

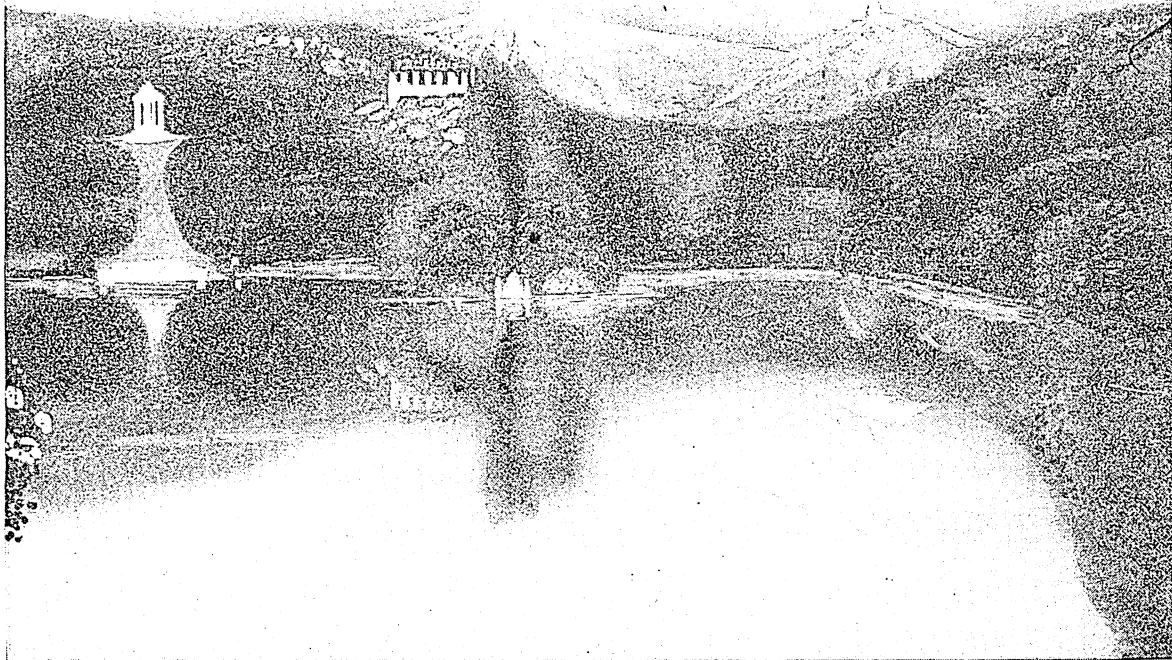


The finches are all frisky little chaps that everybody likes. The farmer likes them because they eat the seeds that produce weeds and they let his grain alone. Nature lovers are fond of them because they are so often beautifully colored. The only member of the family that makes himself a nuisance is the "city chap," the English sparrow who is so abundant in all towns.

inches long, with a black head, chest, and upper parts and white or brownish underparts.

Scientific name of eastern goldfinch, *Spinus tristis tristis*; indigo bunting, *Passerina cyanea*; red crossbill, *Loxia curvirostra pusilla*; slate-colored junco, *Junco hyemalis hyemalis*; red-eyed towhee, *Pipilo erythrophthalmus erythrophthalmus*. (See Bunting; Cardinal Bird; Grosbeak; Sparrow.)

The ARTIST'S ETERNAL QUEST of BEAUTY



"Great nations," says Ruskin, "write their autobiographies in three manuscripts—the book of their deeds, the book of their words, and the book of their art. Not one of these books can be understood unless we read the two others; but of the three, the only quite trustworthy one is the last. The acts of a nation may be triumphant by its good fortune, and its words mighty by the genius of a few of its children, but its art only by the general gifts and common sympathies of the race." What is the origin of this universal reaching out for beauty which is the source of what we call the Fine Arts? What are the various ways in which it finds expression? What are the characteristics of truly great art? The accompanying article presents as simply as possible the answers to these and other questions that arise in considering this most fascinating of human activities.

FINE ARTS. What is "art"? Let us begin shaping our answer to this question by going back to the original meaning of the word. The two letters *ar* form a very ancient word root appearing in many languages. Its meaning is to bind or join together. When a man joins or binds materials together, as pieces of wood in a chair, or lines and colors, as in a picture, he is an artist—one who makes. An *arm*, the part so beautifully joined to the human shoulder, is a work of art, "the art of God." A coat of chain mail, a piece of armor, is made of many metal rings linked ingeniously and beautifully to one another. This is a work of art, the art of man. In both "arm" and "armor" the *ar* appears, and both imply the fundamental significance of art—joining and binding together. To this elementary idea let us add what the great painter Walter Sargent said: "Art is not a mere skilful representation of nature, but a concrete embodiment of a significant range of human experience." Now we have

a broad and firm foundation upon which to build an understanding of our subject.

The various arts are broadly divided into two classes, ordinarily distinguished as the useful arts and the fine arts. The meaning of the former of these terms is self-evident. The fine arts begin when there is a conscious attempt to express beauty in the form of the thing made, and in its decoration.

Man exposed to rain and cold builds a roof and four walls within which to be protected against the elements. His building is a work of useful art. But suppose he makes his roof project, so that it casts a deep shadow on the walls when the sun shines, and that he makes the chimney large, so that his house will not only be, but *seem* to be, a place of shelter and warmth. And suppose that he sets ornamental columns at either side of his door to make it at once suggestive of hospitality and beauty. Then his house does more than withstand the elements; it *celebrates*

its triumph over them. This is the fine art of architecture; a form of emotional expression. And this is precisely what the fine arts are.

This celebrating of the triumph theme is evident in every form of fine art. From the aboriginal song and dance of savage warriors after battle down to the day of Sousa marches, triumph has found expression in the fine art of music. Since before the time of the Greeks, it has been expressed in sculpture. From ancient Egyptian times it has been presented in painting. In every age the fine art of poetry has made triumph its theme.

Architecture, sculpture, painting, music, and literature are not the only fine arts. Wherever there is an effort to express beauty in the form and decoration of the thing made, we find a fine art; and the person who seeks to create beauty thus is an artist.

Art a Universal Language

The joy, pain, devotion, scorn, patriotism, or ecstasy which the artist felt when he wrote the sonnet,

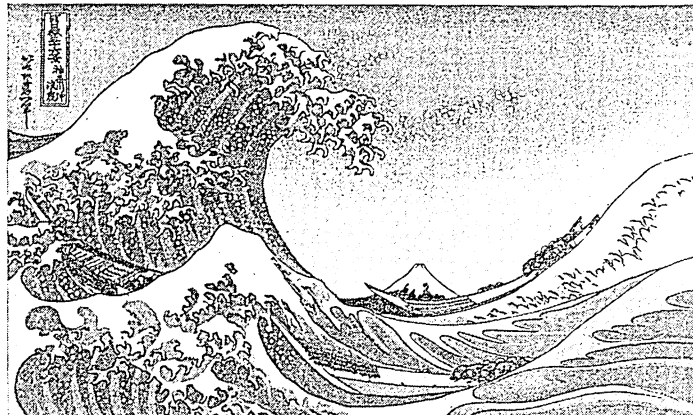
AFRICAN HEAD



In its directly emotional, yet conventionalized, treatment this 16th century African bronze is much like some of our ultra-modern work.

says: "When I paint a wave I am the wave." True. And it is also true that when we look at his painting of the wave we are that wave. When the painter sweeps his brush over the canvas, he feels himself

'AT THE BACK OF THE WAVES' BY HOKUSAI



Does this painting by the great Japanese master make you feel that the wave is almost a living thing whose power you feel as if you were a part of it? If so, then it fulfills for you the chief purpose of a work of art—you share the artist's imagination and emotions.

doing just what the wave is doing. He becomes, as he says, a sort of conscious wave; when we sweep our eyes over the lines where his brush has led, we, too, become a sort of acting, conscious wave.

In answer to the question: "What is a wave?" the scientist with his cold analytic method will explain

that it is the result of certain causes and principles; he will separate it into its elements, and will point out the relations of the wave to other things. He will always lead away from the wave itself. The artist, on the other hand, forces attention solely to the wave. "The real work of art," it has been said, "leads nowhere, and its frame ends the world." In general, art may be

said to show effects, not to seek their causes.

The fine arts make us share the hope, fear, aspiration, joy, and sorrow of humanity, because a work of fine art is always the expression of one or the other of these. Whistler, the most famous American painter, said, "The artist is to arrest and typify in materials the harmonious and inter-blended rhythms of nature and humanity."

Nature and Fine Arts

Another way of explaining fine arts is to say that they are what man makes out of the inspiration which he receives from nature. He is so profoundly impressed that he must give utterance to his feelings, and he does so in a hymn of joy, a nobly formed statue, a perfectly proportioned vase, or the pattern and colors of an oriental rug. In all art, he seeks to preserve the significance of the passing moment—in the joy of seeing a sea-shell or a fern frond and fixing some of that joy which nature has given him in the shape of a silver basin or an Ionic capital, or in the lines of a drawing.

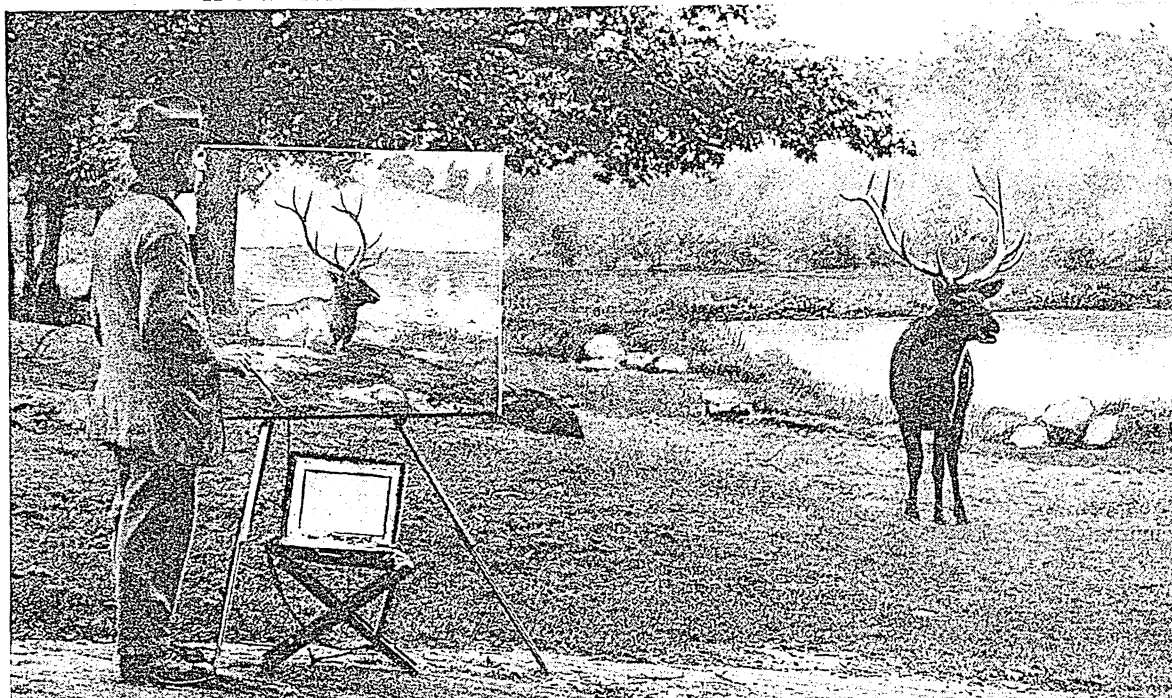
The arts thus inspired by nature put us into a state of receptive calm. They first make captive our imagination or our joy in sight or sound; and then, through

GRECIAN VASE



The classical restraint always evident in the best Greek art is well shown in this hunting scene on a Greek vase of the 5th century B.C.

HOW ANIMAL PAINTERS DO THEIR WORK



This is a good example of the way in which real artists go about their work. This one wanted to show a deer at rest, as his half-done painting proves; but in order to get the deer just right, he had to set up his easel in a deer park, and then study the deer as it moved about. The study of animal life is one of the many interesting phases of the fascinating work of the artist.

the unity and intensity of their interest, they grip our whole consciousness until, like the children and the Pied Piper, we forget all else and follow. Even in this calm, however, there is a sort of activity, for when we are enjoying a lyric, a musical rhapsody, a symphony of color, a bit of Roman glass, or a fine fabric, we are living as intensely as at any other time, but we are free of the conscious effort of living.

What Artistic "Unity" Means

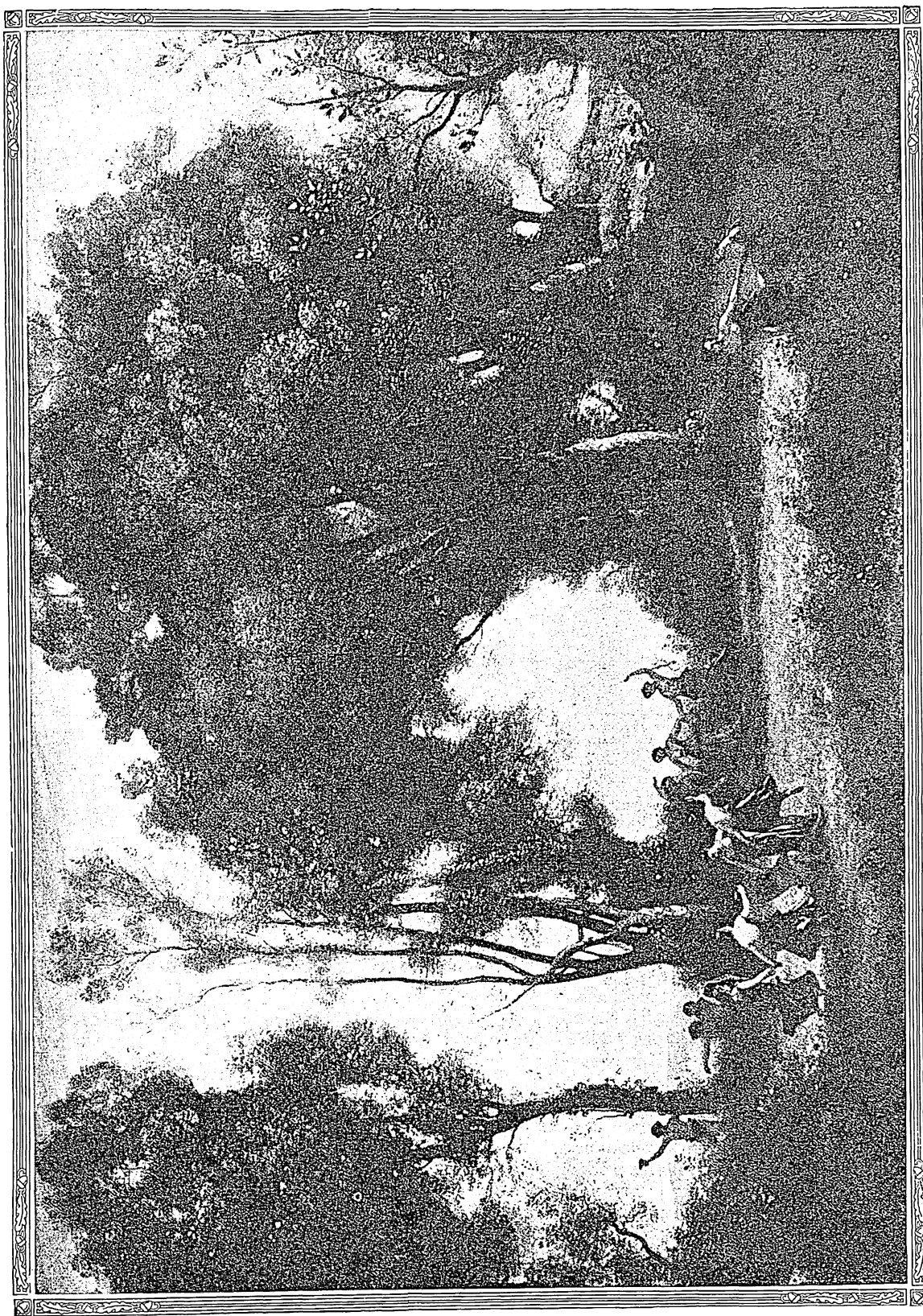
To give this feeling of calm, a work of art must have but one theme; it must be free within itself from conflicting attractions or suggestions; that is, it must have *unity*. Whether it be sonnet, picture, vase, or cathedral, it must at a glance give one unified impression. That impression may be simple, as is that produced by the architecture of a Greek temple; it may be as complex as is that given by the cathedral of Amiens. But it must be *one*. It may be imposing, as in Michelangelo's statue of Moses; or it may be delicate, as in the carvings of the Japanese; but it must produce an unconfused impression. It may be brought about by combining many similar forms, colors, lines, or ideas until they add power to one another, as in the poems of Milton and in the paintings of Corot. It may be brought about by leading the attention to an unlikeness in certain related things, as in Keats' sonnet 'On the Grasshopper and the Cricket', which brings out a contrast. But in any case, a single impression must result.

Nature does not always give us simple relations, and so, if he would produce pictorial beauty, the artist

must make many changes in the "landscape with figures amid which we dwell." He must select, arrange, subdue, and accent the elements of his work so that they will produce the mood or set forth the idea which he is endeavoring to present. He must not admit confusion, the enemy of all the fine arts, unless it is a part of the subject matter, as for example, the picture of a volcanic eruption. It must never be a part of his technique. Whistler said: "Nature contains the elements, in color and form, of all pictures (of all varieties of fine art), as the keyboard contains the notes of all music. But the artist is born to pick and choose, and group with science, these elements, that the result may be beautiful."

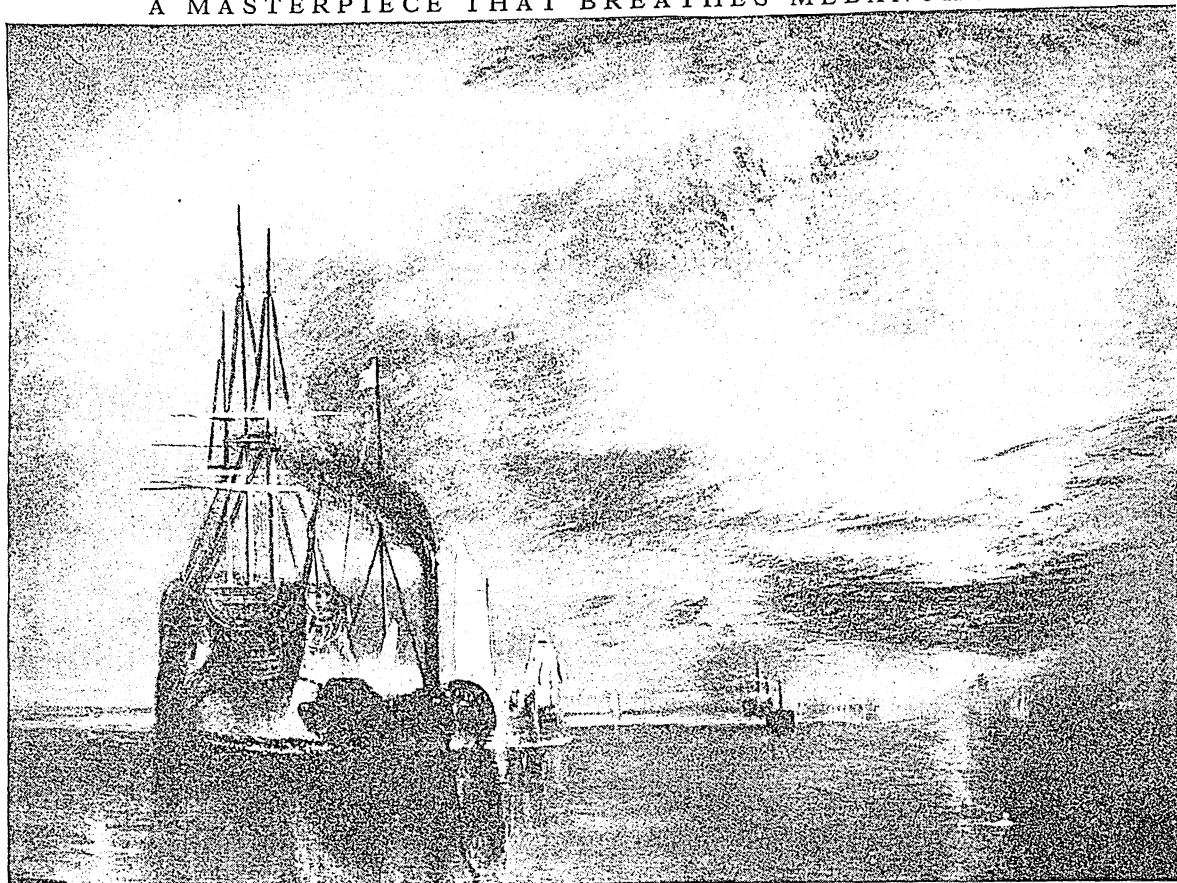
The Meaning of "Composition"

This process of selection and arrangement is called "composition." For illustration we turn to painting. When, in looking over the fields, we send our glance from the trees to the hills beyond them; when we remove our eyes from a person to whom we are speaking, to the walls just behind him; when, in fact, we leave off looking at any one thing and look at something either farther away or nearer than that at which we were looking before, our eyes change their focus in somewhat the way the focus of a camera is changed to suit varying distances. Now, if the artist were to try to paint in one picture the hills as he sees them when looking directly at them, or the trees, or the clouds, he would have a picture with as many separate interests as it contained objects—a picture which would never have unity or give repose of any sort.



The famous painting by Corot, called 'Morning' or 'The Dance of the Nymphs'

A MASTERPIECE THAT BREATHES MELANCHOLY



When you look at the painting, you see an old sailing vessel being towed down a river, and even without thinking about it, you feel somehow that it is a melancholy event. Then, when you remember that the picture is Turner's great work, 'The Fighting Téméraire', and that it shows the "old bulldog" of the British navy being towed down the Thames to be broken up, you catch the full significance of it. In every detail, in the character of the lines and the massing of the shadows, even in the drooping clouds, Turner expresses sorrow that so noble a warrior should come to such an ignominious end. Ruskin said that of all pictures not involving human pain, this work of Turner's is the saddest. It is in this ability to make the very lines and shadows of the picture breathe the spirit of its story that the true genius of art appears.

So the artist must select some one thing for the main theme of his picture, and to this he must subordinate all other things which may occur in it.

In nature it is sufficient if the form of a tree be beautiful against the sky; in a picture the visible shapes of sky seen through the tree must be equally beautiful. The picture, since it is all to be seen at once, must be a beautiful pattern in which every shape is fine. Consistency of character, which has been called harmony, consistency of attractions, which has been called balance, and consistency of movement, which has been called rhythm, will keep all elements of the work together in an integral whole. Here again the artist in forming his work must exercise his aesthetic judgment, varying from nature's appearances, if need be, to bring finer proportion into his work, to give it more perfect unity and deeper meaning.

Let us look at Corot's landscape 'Morning'. It has come to be called 'The Dance of the Nymphs'. Is this because there is a group of tiny figures at the bottom—who in truth are scarcely dancing and who may hardly be called nymphs? Or is it because of the

witchery of that flowing movement which takes us from the bottom up into the picture, across the top and down the other side, lastly circling round and round the bit of sky in the center, leading us, before we know it, in an airy dance through the treetops? The little figures give the keynote—they form a statement of the theme, Morning, Happiness, Dancing. But even if they were suddenly to whisk themselves out and disappear on the other side of the tangled shrubbery, the movement of the picture would still go on, and it would still be a dance of the nymphs.

For a contrasting mood see Turner's great picture 'The Fighting Téméraire'. What is there about this picture to show that this ship is the heroine of England's battles that she is—or to tell us that she is being towed away for breaking up? And yet Ruskin says that of all pictures not visibly involving human pain, this is the saddest. What has the artist done to make us feel the solemnity of this occasion? We see a sheet of still water under a great bending sunset sky. On the other side a tall ship is coming up, towed by a black tugboat. Long ripples are thrown to left and

right, and thin smoke pours back from the funnel of the tug. Shadows are gathering from all sides, and there are the buildings of a great city beyond in the gloom. Study the use of lines. Are they like those merry ones that circle round the canvas of Corot's 'Morning'? Or are they the lines which we see in the solemn groves of pine or cypress, in the desert, and in the great cathedrals? Are they not like the figures in a funeral march? Has the artist accepted Nature only as he found her?

The beauty of a picture, a piece of music, a Greek vase does not lie in pleasing the emotions alone. Perhaps it is impossible for the emotions to be stirred at all without the mind receiving some deeper message through it. Thus, art is a sort of language; but the message which that language has to give is not an intellectual one. Art does not exist primarily to set forth facts. The message from a picture, like that of the music or from the vase, comes as an experience, a mood which the work awakens within us, and not as a story which the thing itself tells. A Bokhara rug may be of "sleepy coloring" and give us the repose of twilight as we contemplate it; a clear melody may give us the same feelings as a view from a mountain top; a dash of thrilling color may be to us like a battle-hymn; the curve of a vase may absorb our whole being. Such, and numberless others, are the artistic messages we may receive if we fit ourselves to receive them, instead of the commonplace message that "here is a man and he is doing so and so." These are the feelings which come to us straight from the heart of the artist himself, even though he be centuries in his grave. The tree, the figure, and the incident are merely the words of the message. Its charm or inspiration is something very different. We are aware of this when we look at a 13th-century stained glass window, a silver teapot by Paul Revere, or the spire of a great cathedral.

Three principal considerations compel an artist to turn away from attempting to copy nature slavishly. Of these, doubtless the chief is the desire for expression of emotion. Intimately related to this is the second, namely, absolute beauty, a beauty other than that which is associated with the subject as being merely one of the many things in life. This is feeling for beauty which Jean Siméon Chardin (French, 1699-1779) or

Emil Carlsen (American, 1853-1932) get into a picture of such objects as a ragged book, a cut of meat, or a battered copper pot. And so we see why beauty may be defined as being a light which shines *about a thing* and is not the thing itself. The third deals with the translation of the three-dimensional aspect of nature into the two-dimensional limits of a picture or a pure

pattern. Artists whose aim is merely to portray nature are busy with only the vocabulary of art and not the ideas; with externals and not emotional reactions. These three considerations give artists a working grammar of art, the means, along with the vocabulary, of expressing themselves; but their expression in terms of beauty and permanence—be it in pottery, weaving, metal working, painting, architecture, or poetry of deep human experience—is the great purpose of them all. Its attainment stamps the seal of success on all that can properly be called "the fine

arts." Without this successful expression of experience or emotion, it becomes mere slavish reproduction.

Industrial Arts

By industrial arts, decorative arts, we understand all those things which make our dwelling rooms attractive. William Morris, an Englishman (1834-1896), started a movement to increase the beauty of common

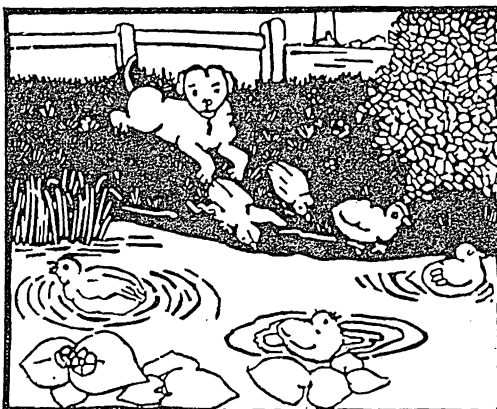
objects and to add beauty to machine-made objects of daily use (see Morris, William). This revolution in taste spread over Europe and the United States. Since the opening of the 20th century France has done a similar thing with distinguished, far-reaching success. At present the improvement of taste and the betterment of design in our own country are making great headway through the interest of educational institutions and the support of manufacturers and retail establishments. (See Industries and Industrial Arts.) Artists are being

asked to bring their training and taste to bear on labels, packages, and even the shapes of products.

Cycles in Art's History

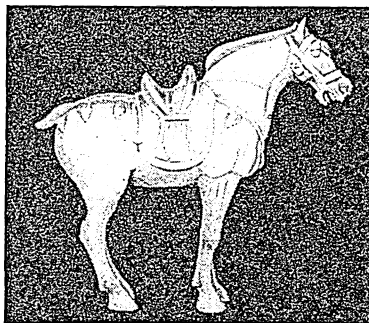
The story of art from ancient to present times is a record of many changes, tendencies, and attainments. Once these have run their course, they seem to begin all over and repeat, like a wave which rises to its crest and then subsides to its trough again and again. First, in every fine art, comes a childlike technique and strong emotion, as seen, for example, in the drawings

A CHILD'S CONCEPTION OF SPRING



'Spring' was the subject assigned to the 13-year-old child artist, a pupil of Professor Cizek of Vienna, who has interpreted in a naive manner the spirit of the season in this jolly woodcut, 'Dog and Ducks'.

CLAY HORSE, CHINESE



All the pent-up fire and energy of this powerful animal seems to have been concentrated in the T'ang artist's figure.

of children in Cizek's classes, or the glazed pottery horses of the ancient Chinese. Later comes the stage of developed technique, in which emotion is still strong, as, for instance, in a Paul Potter bull, a Rembrandt landscape, a statue by Michelangelo. Last comes a consuming passion for realism, the effort to make everything—picture, carpet or wall-paper design, sculpture—deceptively real to vie with nature, not to create. In the industrial arts this tendency is seen in an extreme concern for detail, as in flower-painted Chinese jars as compared with Dresden ware, ornamented with naturalistic flowers in relief.

After a period of realism, which is the siren that lures all the arts to destruction, comes reaction to pure design and pattern. Many believe that we are just now entering such a period. They believe that modernistic art, although it is productive of some absurdity, is none the less leading to better things. What was considered beautiful in earlier days is still a part of the beautiful, but it does not impress us today as it did then. As life changes, so does beauty; and since the fine arts express life, they are affected by the tempo and the spirit of change and

results; for example, the 'Dog and Ducks' by a 13-year-old child. Opportunities are given for actual work with the materials and the tools of various fine arts. Through successes and failures the pupils learn of the difficulties involved, and their sense of appreciation and selection is thereby awakened as in no other way.

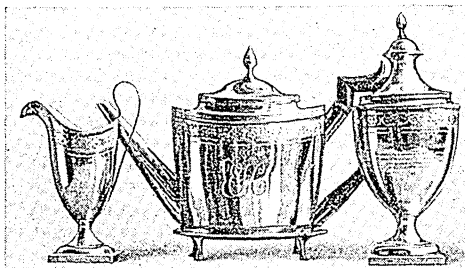
How can we learn to appreciate good pictures, sculpture, engraving, and other forms of fine art, when there are so many kinds, and so many conflicting opinions about them? There are no sure rules for doing this any more than for appreciating good literature; but a few suggestions have been helpful.

How to Appreciate Art

First of all, never try to force your likings. Give them a chance to develop by looking at all kinds, especially heed what good authorities call excellent. Second, never condemn

a work of fine art because its subject does not appeal, or is absolutely distasteful to you. Distinguish between the picture or object as an arrangement of color, shadow, line, and mass, and as the portrayal of a specific subject. Look for patterns as apart from the details which express them. Look for rhythms. Look

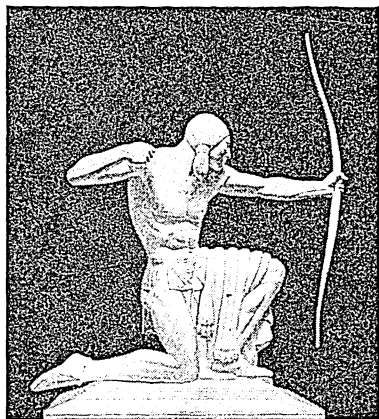
PAUL REVERE TEA SET



Sheer beauty of line and simplicity of design are reflected in this symphony in silver, the work of the Colonial artist and patriot, Paul Revere. This set is preserved in the Museum of Fine Arts, Boston.

INDIAN HUNTER WITH BOW AND ANTELOPE

This modern group, an Indian of the prairies with his bow, and a prong-horned antelope, graceful even in its death spring, is the work of Paul Manship.



One listens instinctively for the twang of the bow-string which has just been released by the hunter. The startled antelope scented its danger too late. A crisis in the lives of both has been imprisoned by the sculptor. Can you see the likeness of mood and method between this group and the African head shown on page 37?



efficiency in present-day living. In general, the modern tendency is toward simplicity and usefulness.

Fine Arts in the Schools

There is no better witness to the fact that the fine arts help to explain life and add happiness to it than the marked increase of interest in them which present-day education is showing. Methods of teaching focus attention on making them means of self-expression. One of the world's successful art teachers of children, the famous Prof. F. Cizek of Vienna, assigns a subject, such as Spring, or Autumn, and leaves each child to invent his own expression by using the forms and facts which he has gathered from his own experience. Startlingly fresh and often beautiful have been the

for deft lines that bind the parts into one unified whole. Heed with utmost care the picture that at first glance gives you a single clear impression. Look for strength first, and admire delicacy afterward. Be neither intellectually brow-beaten by a great name—the greatest have their weak moments—nor contemptuous in the presence of an unknown one. Use eyes and mind wherever pictures are concerned and be glad when they make your heart beat rapidly. Remember George Meredith's words, "He who sees well is king of what he sees; eyesight is having."

(For further study see Architecture; Language and Literature; Music; Painting; Sculpture; and the Reference-Outlines accompanying these articles.)

FINGER-PRINTS. Look closely at the ball of your right thumb. Use a magnifying glass if you have one. You will see that the skin is covered with fine curved lines. Press the ball on an ink-pad and then on a sheet of white paper. This will give you your thumb autograph. No other thumb in the world, not even your own left thumb, will give a print just like that; and the same is true of all your fingers, and everybody's fingers.

This fact has been put to practical use by police departments of many countries. When a criminal is caught, he is photographed and his finger-prints are taken to identify him in case of later offenses. Criminals have also frequently been detected by their finger-prints on door-knobs, window-panes, etc., at the scene of their crime.

Finger-prints for identifying persons who sign legal documents were first used by the Chinese, and in early instances in the history of England and America, thumb-prints have served as the signatures of persons who could not write. But the system did not come into use for the identification of criminals until Sir Francis Galton, the great British scientist, published in the last part of the 19th century a detailed study of finger-prints. Sir Edward Henry, commissioner of the metropolitan

Its Federal Bureau of Investigation obtains finger-prints of criminals from world-wide sources, and also receives millions voluntarily submitted by citizens.

The finger-print method of identification has almost entirely replaced the famous Bertillon system of measurements devised by Dr. Alphonse Bertillon in Paris in 1885. This method depended on accurate bodily measurements, such as the length of arms and legs, and the length, width, and general shape of the head and other parts of the body least likely to change. The objection to this method

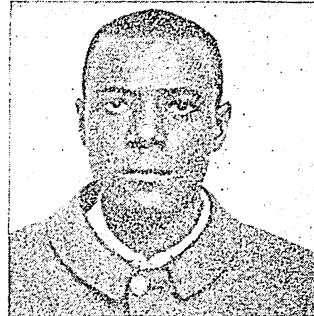
is the difficulty of making such measurements sufficiently exact.

A system of foot-print identification for very young babies has been adopted in many hospitals in large cities. Foot-prints taken soon after birth are carefully filed, so that if the name tag worn by the child should be lost, a comparison of its foot-print with the filed prints will at once establish its identity. Prints of the feet are taken rather than of the fingers, because

the lines of the new-born fingers are too faint.

Finger-prints also prove useful in dealing with illiterate members of backward populations, and the United States Army records the finger-prints of its soldiers. Banks and trust companies have also ex-

FINGER-PRINTS SOLVED THE MYSTERY



Wouldn't you suppose that the two photographs above were of the same person? That is what the United States authorities thought when the man on the left was sent to the Federal Penitentiary at Leavenworth, Kans., in 1903. He had the same name as the man on the right, his bodily measurements were practically identical with his namesake's, and but for the evidence of the finger-prints the confusion might never have been cleared up.

HOW YOUR FINGER-PRINTS FOLLOW YOU THROUGH LIFE



These three groups of finger-prints are all of the same person, taken at the ages of 26, 44, and 83 (from left to right). Notice how the loops and ridges remain virtually unchanged, even when the skin has been cracked and shriveled by extreme age.

police of London, made this the basis of a filing system which enables an expert to pick out a criminal's record from thousands of others in 15 minutes.

The Department of Justice at Washington, D. C., files millions of finger-prints, including those of aliens, for whom such records became compulsory in 1940.

perimented with finger-prints on checks and legal documents, as a safeguard against forgery. They make identification of the signer certain, but the method is too cumbersome to find general favor. In Argentina, however, finger-prints of all immigrants are taken and kept in a national bureau.

FINLAND. In their far northern homeland, the hardy athletic Finns have developed a vigorous and distinctive society. Freed from Russian rule by the World War of 1914-1918, they created a stable and progressive government. When Russia threatened their independence only 20 years later, they amazed the world by the courage and skill with which they defended their young republic against overwhelming odds.

A land of lakes and forests, Finland extends 700 miles from the Baltic Sea to the Arctic Ocean. Its average width is 240 miles; its area, about 135,000 square miles. To the east lies Russia; to the west, the Gulf of Bothnia. North of this gulf, Finland has a common boundary with Sweden and Norway. Its narrow neck of Arctic coast line is kept free from ice in winter by the Gulf Stream, while the southern harbors are frozen. On the southern border is the Gulf of Finland, which is dominated by Russia. About 10,000 rocky islands fringe the coast, the Aland group alone numbering some 6,000.

The land, for the most part low, becomes mountainous in the northwest, where Mt. Haltia rises to a height of over 4,000 feet. The glaciers of the Ice Age gouged the granite bedrock, leaving the country generally rough and stony and dotted with some 65,000 lakes. The glaciers also left large marshy areas—hence the Finnish name for the country, *Suomi*, meaning swamp. But along the south and west coasts is a rich clay soil, and in this region are the best farms, as well as the chief cities.

The lakes, the rivers which radiate from them, and canals provide extensive internal waterway systems. Rafts of timber float down the rivers to mills or to ports; and hydroelectric plants harness the rapids to furnish power, for Finland lacks coal.

The south has six or seven months of winter; the north, eight or nine months. During these months the entire land is covered with deep snow, which supplies much of the average yearly precipitation of 20 inches. In summer the sun shines 20 hours a day and the temperature averages about 60°, so that grains ripen in six or seven weeks.

Forests of pine, spruce, and birch, the chief source of wealth, cover three-fourths of the land area. Wood products make up four-fifths or more of the value of exports. Butter, cheese, and fish are also exported. Copper, nickel, and low-grade iron ore are mined and granite is quarried. There are manufactures of wood products and machinery, but manufacturing is handicapped by lack of raw materials.

Only about 6 per cent of the land is under crops. Wheat, rye, barley, and potatoes are grown. Hay is an important crop, for the dairy cattle cannot be pastured in winter. Small farms are the rule. Most of them are on waterways and many farmers are fishermen as well. Coöperatives penetrate every phase of economic life. Buying, selling, exporting, apartment-house building, and the financing of the farmers are among the many activities handled coöperatively.

The cities contain only about one-fifth of the population. They are small and few, but modern in appearance, with broad streets. Helsinki (Helsingfors), on the south coast, is the capital and chief seaport. Turku (Åbo) and Vaasa (Vasa) are other ports, and Tampere (Tammerfors) is a manufacturing center.

The Finns compose most of the population of about 3,665,000. They belong to the Finno-Ugrian language group, which includes the Estonians and the Magyars of Hungary. In the southwest are many people of Swedish descent and in the far north are the Lapps (see Lapland). Finnish and Swedish are both official languages, and cities commonly have two names.

Finland is a nation of extraordinarily high culture. Illiteracy is less than 1 per cent. In the 19th century the poet Lönnrot compiled a dictionary of the Finnish language and brought together the scattered bits of the 'Kalevala', the Finnish epic (see Story-Telling). The rhythm and spirit of this great poem were imitated by Longfellow in 'Hiawatha'. Among the noted men of contemporary times are the composer Sibelius, the architect Saarinen, and the novelist Sillanpää, who won the Nobel prize in literature in 1939.

For nearly six centuries Finland was under Sweden's rule. But in 1809 Russia finally won the land from Sweden and made it into an autonomous grand duchy. In 1917, during the Russian revolution, Finland declared its independence. A republic was set up in 1919. In November 1939 Russia demanded strategic Finnish territories and, upon Finland's refusal, invaded the land. After valiant resistance, Finland was compelled, in March 1940, to sign a peace treaty granting Russia all its territory bordering on Lake Ladoga, a section of northeast Finland with a strip on the Arctic Ocean, and a 30-year lease of the naval base of Hangö. In June 1941, after Germany invaded Russia, Finland went to war once more against the Soviet Union, to regain the territories it had lost. (See also Russia; World War, Second.)

FIR. To most of us, the word "fir" calls to mind the graceful, fragrant balsam fir so much used as a Christmas tree. There are many other firs, however, distributed over the Northern Hemisphere. The balsam fir of the eastern United States and Canada is from 40 to 60 feet high. A smaller relative, the southern balsam fir, grows only in the southern Appalachians. Resin-filled blisters on the branches are the source of Canada balsam, which is used as a transparent cement for optical glass and for mounting preparations for the microscope.

The western firs are larger, reaching heights of 200 or even 300 feet. Among these are the white fir, the lowland white fir, the red fir, the silver fir, and the noble fir. Most of the firs are used to some extent for lumber and pulpwood, but their wood is not so valuable as spruce and pine. (See also Spruce.)

The Douglas fir is not a true fir. It grows to a height of 300 feet and a diameter of 10 feet. Some trees have been known to reach an age of 1,000 years. It grows from the Rocky Mountains to the Pacific coast, and from Mexico to central British Columbia. It is second only to yellow pine as the most important timber in the United States.

The true firs form the genus *Abies*. Scientific name of balsam fir, *Abies balsamea*; southern balsam fir, *A. fraseri*; white fir, *A. concolor*; lowland white fir, *A. grandis*; Douglas fir, *Pseudotsuga taxifolia*.

WHAT FIRE IS *and* How IT SERVES MAN

The Flaming Spirit that Man Has Tamed and Trained to Come and Go at His Bidding—Some Queer Kinds of Fire and what Makes Them

FIRE. In these days it is hard to realize the awe with which early peoples regarded the "red monster," which they believed came down in magic ways from heaven (*see* Prometheus), and which many of them worshiped as a representative of their gods (*see* Zoroaster). Ancient Greek philosophers conceived that fire, air, earth, and water were the four elements of which the whole universe was made.

It is supposed that the earliest savages obtained their fire accidentally, from trees set ablaze by lightning, or from spouting volcanoes, and that they treasured it carefully in huts and caves. Careful inquiries go to prove that man from the earliest days has never been without fire for warmth and cooking, and for protection from wild beasts in whom it inspires terror. By and by men discovered how to create fire by rubbing dry sticks together and they invented ingenious fire-drills to aid the process. When they began to chip flint to make axes they learned that fire may be drawn from stone, a method which developed into the flint-and-steel of comparatively recent times (*see* Matches). Still later men found out that fire could also be made by focusing the rays of the sun through a glass lens.

The Great Chemist who Discovered the Nature of Fire

But however much human beings turned fire to useful purposes, they remained ignorant of its true character until the great French chemist Antoine Lavoisier investigated, in 1783, the properties of *oxygen*, and laid the foundation for modern chemistry (*see* Oxygen). Popular indifference to great truths was never better illustrated than in Lavoisier's case, for he was condemned in 1794 by the Terrorists of the French Revolution to have his head chopped off on the guillotine. "The Republic has no need of scientists," said the judge, who pronounced this cruel sentence.

Nevertheless before his death Lavoisier had succeeded completely in disproving the old "phlogiston" theory, which held that when any object was heated

MAN'S FIRST MASTERY OF FIRE



Presumably man first acquired fire by finding trees that had been set to burning by lightning, or taking it from active volcanoes. But it did not truly become his servant until he learned to produce it at will by rubbing dry sticks or striking stones together, as we see him doing here.

or cooled it was due to a mysterious substance (phlogiston) which flowed into or out of the object in question, and we know today that ordinary fire is due to the chemical process called oxidation, which means the combination of a substance with oxygen. That is why fires need air to burn properly, and why a flame will go out after it has used up all the oxygen in a closed vessel. Almost anything will combine with oxygen if enough time is allowed. Iron will rust if exposed long to damp air, and that rust is simply oxidized iron. But when the chemical combination is so rapid that it is accompanied by a flame it is called *combustion*.

To start combustion heat is required. The degree of temperature at which any substance will catch fire is called the *ignition point*, which, of course, varies with the condition of the substance, the pressure of the air or the other gases involved, etc. When the savage rubbed two sticks together, he discovered without knowing it that the ignition point of wood is usually quite high, in other words he had to use a good deal of muscle and create a good deal of heat before flames appeared. But the tip of a match is composed of chemicals which, under ordinary circumstances, have a low ignition point. The heat created by simply scratching it once is enough to start combustion.

The ignition points of some vegetable and animal oils are very low. They oxidize so rapidly as to generate a great deal of heat, and if kept in a confined place will spontaneously take fire. Many fires are caused by the spontaneous combustion of heaps of rags, paper, woollens, and other substances strongly impregnated with oil. Coal, charcoal, and green hay stored in large piles sometimes generate heat enough to cause spontaneous combustion.

Thus we see how a fire is started, but what makes it keep on burning? The answer is one of the most important laws of fire. In scientific language it is this: A fire will be self-supporting only when the tem-

perature created by the combustion of the burning substance is as high or higher than its ignition point. Some very hard woods, like ebony for instance, require a great deal of heat to burn them. If you put the end of a stick of ebony in a coal fire it will burn, but when you draw it out, the fire of the smoldering ebony itself is lower in temperature than the ignition point of ebony and the flames will go out.

This principle explains why you can blow out a match. Your breath carries away the heat until the temperature falls below the ignition point of the matchstick. The stream of water from a fireman's hose cools the burning walls of a building with a similar result.

The heat of a fire depends upon the speed with which chemicals combine with oxygen. This speed in turn depends generally upon the quantity of oxygen present. If we take a bit of iron wire and touch a match to it, it will not burn. But fasten the tip of a match to the end of the wire, strike it, and plunge it quickly into a jar of pure oxygen. The wire will catch fire and burn, with bright sparks shooting off briskly (*see Air*).

Fires that Make No Flame

There are two kinds of fire, with and without flame. The presence of a flame always indicates that the heat has first forced a gas from the burning substance, and that this gas in turn combines with the oxygen in the air. When a coal fire flames, it is because gas is being forced out of the lumps of coal. By heating the coal in kilns in the absence of air, so that it will not catch fire, this same gas may be extracted and stored for future use in gas stoves. The coke, which is left after gas is extracted from the coal, burns without flame. In this case the oxygen combines directly with the carbon in the coke without forcing out gas (*see Gas, Manufactured*).

It is the gas given off by the heated wax in a candle which produces the bright flame. To prove this, blow out a candle which has been burning for some time. A thin ribbon of smoke will arise. Pass a lighted match through this smoke an inch above the wick. A tiny flame will run down and light the candle again.

The brightest flames are not always the hottest. Hydrogen, which combines with oxygen when burning to form water, has an almost invisible flame, even under ordinary circumstances. When it is absolutely pure and the air around it is completely free of dust, the hydrogen flame cannot be seen even in a dark room. The scientist who proved this fact had to feel around with his hands to find his burner. We may imagine that he had no difficulty in knowing when he reached it, for the hydrogen flame is one of the hottest of fires (*see Hydrogen*).

The Fire that Makes Gas Engines Go

When an inflammable gas is mixed with air in exactly the quantities necessary for complete combination, it will burn so fast as to create an explosion. This is what takes place in a gasoline engine. The

carbureter provides the air mixture and the electric spark sets it on fire. (*See Gas Engine*.) The occasional small explosions after the burners of a gas stove are turned off are due to the same fact. A little gas is left in the pipe, more and more air creeps in through the air valve until the mixture becomes explosive and the tiny flame remaining on the burner thereupon "fires back."

A substance is called *inflammable* when it can be ignited in the air under ordinary circumstances. But what would you say if you were told that air itself is inflammable under certain conditions? All you have to do is to reverse the process of a gas stove. If instead of having gas in the pipes and air outside, you had air in the pipes and gas outside, you could light the stove and cook with it just the same, for the combination of gas and oxygen would be equally effective. So, if men lived in an atmosphere of coal gas, we would be paying to have air piped into our homes for our cooking. Thus, when we say that some things will burn and others will not, we must remember that such a statement always means "in ordinary air."

The history of fire is the history of progress. As men have learned gradually how to tame the "red monster" and make him their servant, they have been able to develop the great forces of nature (*see Civilization*). Fire has yielded them the power of steam; it has extracted the metals from the rocks, the rubber from the gum of a tree, made hard brick from soft clay. Every factory chimney is a monument to the importance of fire. Every instrument we use, almost everything we eat, all our conveniences, even our ice, owe their existence to fire.

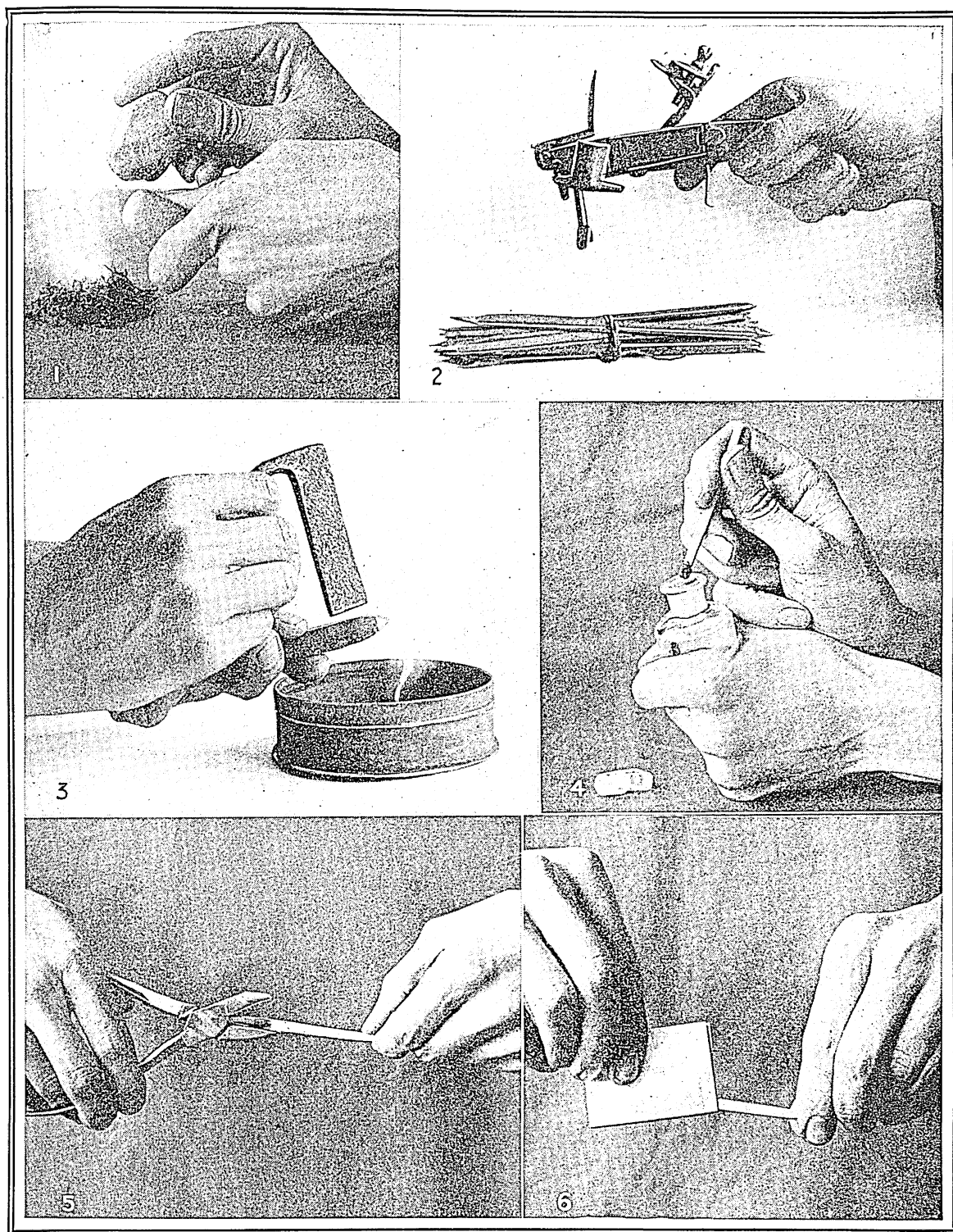
Worship and Legends of Fire

Fire-worship and legends associated with the origin of fire have existed since the earliest times. In many cases fire-worship was associated with sun-worship, and fire was regarded as the earthly representative of the sun-god. A common feature of such worship was the practice of preserving "sacred fires" in the temples.

The Prometheus legend and the religion of Zoroaster, two of the best-known examples of this kind, have already been referred to at the beginning of this article. The latter, known also as Persian sun-worship, is of extremely ancient origin, but persists to this day. When the Parsees fled from Persia to India in the 8th century, they carried with them their sacred fires, which are said to have been kept burning ever since. Other famous examples of the veneration of fire are found in the "sacred flames" of the Vestal Virgins in ancient Rome, and the "fire altars" maintained by the Aztecs.

North American Indians attributed the origin of fire to various animals which, according to tribal legends, first showed their far-off ancestors how to make it—the buffalo by striking sparks from stones with its hoofs, and the panther by scratching the rocky hillsides with its sharp claws.

SOME OLD WAYS OF MAKING FIRE



Among the oldest of methods for getting fire is that of striking stones together (1), the spark igniting dried moss or leaves. With one improvement—the use of steel instead of a second stone—this process served man until approximately a hundred years ago. The “fire pistol” (2) shows one of its best developments. The flint was struck against steel when the trigger was pulled, and the sparks ignited inflammable material in the body of the “pistol.” The ordinary flint and steel (3) is a less complicated arrangement. Then chemistry came to man’s aid with the first match (4). It was tipped with a substance which ignited when the match was dipped in acid. The old “promethean match” (5) used the same principle, but the acid was contained in a tiny vial which was crushed with pliers. The first real match—the so-called “lucifer” or friction match—was invented in 1827, and was ignited by drawing the head through folded sandpaper.

From the ARQUEBUS to the AUTOMATIC RIFLE



The Story of the Small Metal Tubes that Transformed Warfare and Hunting—How They Grew Smaller and Lighter while They Gained in Power and Range—The Ingenious “Twist” inside the Barrel which Worked a Magic Change in Firearms



FIREARMS. A rough metal tube about three feet long, closed at one end and fastened to a straight stick, was the first hand-gun ever used. It was loaded through the muzzle with crude gunpowder and bits of stone or metal. One man held the stick braced under his arm. Another applied a fuse or “match” of smoldering tow to a touchhole near the breech. Both said their prayers and closed their eyes. The gun went off with a tremendous roar, a burst of flame, and a great cloud of smoke. If the enemy was not more than a hundred feet away, a few might be wounded; but usually they got off with a bad scare. But the gun was just as likely to blow up and kill the men who operated it.

Now let's look at today's direct descendant of that ancient hand-gun. It too has a metal tube fastened to a wooden “stock” or handle. It too is loaded with powder and bits of metal. The fundamental principles are exactly the same; but see what a difference in its performance! A man lies down, holds the wooden stock to his shoulder, glances through the sights, and presses a small trigger. The weapon starts a sharp *put, put, put!* but there's little flame and no smoke. While you count “one, two,” 12 bullets, swifter than sound, have hit a six-foot target half a mile away, penetrating a steel plate a quarter of an inch thick!

Between the 15th century hand-gun and the 20th century automatic rifle stretches an almost infinite variety of ingenious and interesting firearms, developed out of men's keen competition in warfare and hunting. Here we can only trace briefly the mechanical development of the so-called “small arms”—muskets, rifles, shotguns, revolvers, pistols—leaving the history of cannon and artillery which developed earlier than the hand-guns, and of explosives, to separate articles (*see Artillery; Explosives*).

When the first hand-gun was given a curved stock with a wide butt to be placed against the shoulder,

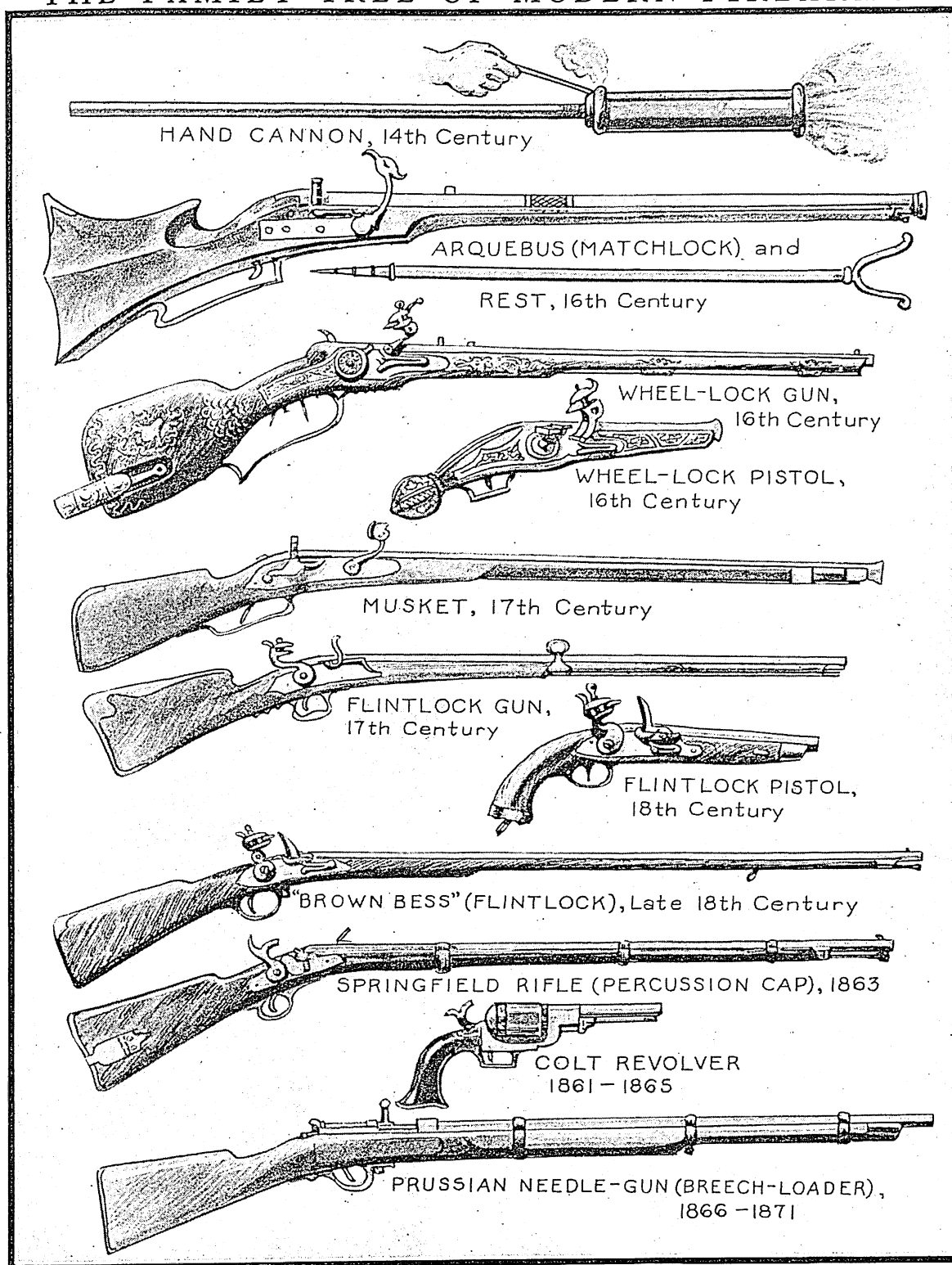
it was called a “hackbut” or “arquebus.” This was soon improved by fixing a hammer on the gun to hold the taper or match, which was brought down to the touchhole by a trigger. Weapons equipped with this device were called “match-locks.” They continued to be clumsy arms, useless in rainy or windy weather, and not nearly so rapid and effective as the long-bow and cross-bow at their best.

About 1540 the Spaniards developed a longer match-lock with a bore a little larger than that of the standard modern shotgun. This was called a “musket,” a term which came to be applied to all military hand-guns up to the time of the rifle. The early muskets were so heavy that they required a rest, and musketeers carried long forked rods, which they planted in the ground to hold up their weapons while they fired. They were usually loaded with a single round bullet of lead, which was forced down against the powder with a ramrod.

Early in the 17th century the “flint-lock” was invented, which made the burning fuse or “match” unnecessary. The hammer, operated by a spring, had a head like a vise which held a piece of flint. Around the touchhole on the side of the barrel was a priming pan with a hinged cover, which had an up-thrust wing of furrowed steel. When the trigger was pulled, the hammer fell and the flint struck the winged cover and opened it, sending a shower of sparks to fire the powder in the pan beneath. The flashing of this priming powder through the touchhole set off the charge in the barrel and fired the gun.

The flint-lock musket was the constant companion of the early American colonists. With its aid, and with the shorter bell-mouthed “blunderbuss”—the forerunner of the shotgun—the Puritan fathers supplied the family larder with game and overcame the Indians. This type of musket was the “Brown Bess” of the British infantry for more than a century, and

THE FAMILY TREE OF MODERN FIREARMS



Five hundred years of firearm history are shown above, and we notice four great developments from the original "Hand Cannon." The "Hand Cannon" was just a tube, ignited with a red-hot iron applied to the "touchhole," and supported by holding the stick under the arm. The Arquebus changed the stick to a stock held against the shoulder, lengthened the tube, and provided a mechanism for applying a burning "match" by pulling a trigger. It was supported on a metal fork. The next six weapons, including the famous "Brown Bess" of Wellington's armies, used the flintlock for firing. The Springfield gun of Civil War days introduced rifling and percussion cap ignition, which was also followed by the revolver. The Prussian Needle-Gun established breech loading.

the arm of the "Minute Men" at Lexington and Concord and Bunker Hill. With it were fought the battles of the French Revolution, the Napoleonic wars, the War of 1812, and many another great historic struggle.

A Scotch clergyman named Forsyth first patented the use of fulminates for firearms in 1807, and during the first half of the 19th century the percussion cap for igniting the powder slowly replaced the flint-lock. This system depended on the fact that certain explosives, called fulminates, are set off when struck a sharp blow. In percussion cap guns a nipple was set perpendicularly in the breech and on this was placed a small copper cap containing the fulminate. The cock or hammer, when released by the trigger, struck and exploded this cap, sending a jet of flame into the powder chamber. Percussion-cap guns were the chief infantry weapons on both sides in the American Civil War.

The Frontiersman's Deadly Rifle

But the old musket had always suffered from two great defects. The round bullets had to be of large diameter or caliber to get the required weight and striking force, and hence the air resistance slowed them down very rapidly. Also, they were set to rolling as they passed out of the smooth-bore barrel, which made them "curve" like pitched baseballs, so that accuracy was impossible beyond a hundred yards.

To overcome these defects the principle of rifling was adopted. This consisted of cutting spiral grooves or ridges inside the barrel to grip the bullet as it passed through and give it a corkscrew spin. The rifling put an end to the erratic flight of the balls, and eventually permitted the use of long cone-shaped bullets, giving the projectile greater weight without increasing the air resistance. The spinning motion kept the points of such bullets forward, instead of allowing them to turn end over end as they would have done if used in the old smooth-bore guns.

Although the principle of rifling was discovered in the 16th century, no great use was made of it for 100 years. Peter and Henry Leman of Lancaster, Pa., were the first to make rifles of a short German pattern in America. Not until the idea was developed into the long small-bore guns of the backwoodsmen of the American colonies, including such men as Daniel Boone, did the rifle become a truly effective weapon. In the War of Independence the British learned to their sorrow of the long range and deadly accuracy of such rifles in the hands of Virginia and Kentucky pioneers, and the lesson was carried back to Europe.

The rifles of these early frontiersmen were loaded from the muzzle with round bullets wrapped in a "patch" of greased linen or buckskin, to make the bullet fit the rifling more closely. Even so, it was a slow process to force the bullet home down the grooves and the smooth-bore musket with its loosely fitting ball continued to be the chief military weapon for this reason. As for the cone-shaped bullet, the increased friction of its long sides made its use next to impossible

in the muzzle-loader, until the invention of the famous Minié ball (adopted about 1852, in Europe), which fitted loosely at loading and expanded to fit the rifle grooves when fired.

But it was not until the breech-loading principle came into use that the rifle could rival the smooth-bore in speed of operation. In 1810 John H. Hall, an American, had invented a breech-loading flint-lock rifle, with a hinged chamber at the breech which tilted upward to receive powder and ball, and then dropped down opposite the opening of the barrel. This device, however, allowed a great leakage of powder gases, as did the revolving-cylinder rifle invented in 1836 by Samuel Colt, the father of the modern revolver.

The first successful military breech-loader came with the use of cartridges, which contained in one paper package the powder and the bullet, and so could easily be inserted in the breech after tearing off a corner with the teeth to expose the powder to the fire from the percussion cap. The Prussian "needle-gun" was among the earliest military types of cartridge-firing breech-loaders, and with it the Prussian armies were able to overwhelm the Austrians in 1866.

The adoption somewhat later of copper and brass cartridge shells stopped virtually all gas leakage at the breech, for the shell expanded on explosion, tightly sealing the breech opening. The "Old Reliable" Sharps buffalo-gun and the Remington were among the most famous of the early sporting rifles using this principle. The United States Army "Springfields" (model 1865) were produced by altering the "cap-and-ball" model of the Civil War to breech-loading cartridge rifles, which continued in use as late as the Spanish-American War.

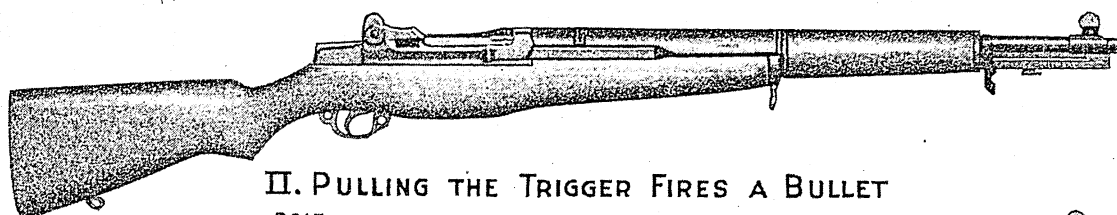
The first metal cartridges were of the "rim-fire" type, that is, they were exploded by a blow of the firing pin on the outer rim, beneath which was the fulminate. These were soon displaced, in all except the smallest calibers, by the "center-fire" cartridges of today, in which the cap occupies a small pocket in the base of the brass shell.

Ejecting the Empty Shells

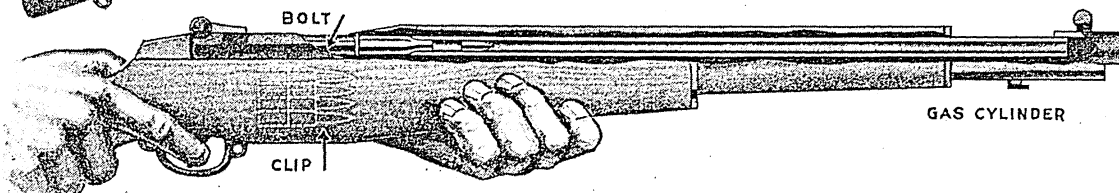
The breech mechanism of cartridge guns was early equipped with an ejector which cast out the empty shell when the weapon was opened for reloading. It was a simple step to add a magazine in which several cartridges could be placed, with a device for bringing them successively into proper position in the firing chamber, so that as fast as one was fired and ejected, another would be thrust in. This gave us the various types of repeating rifles, some with tube-magazines running up through the stock (like the Spencer rifle), or fastened beneath the barrel (like the old Colt "pump-gun" or the early lever-action Winchester models). Others had box-magazines of the Mauser type in which the cartridges lie one above the other in a compartment at the breech. The latter method, combined with the bolt action, prevails in nearly all modern military rifles, such as the Springfield

HOW THE SEMIAUTOMATIC RIFLE WORKS

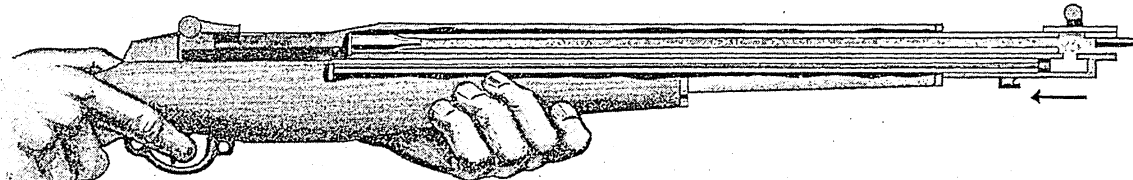
I. THE RIFLE READY TO FIRE



II. PULLING THE TRIGGER FIRES A BULLET

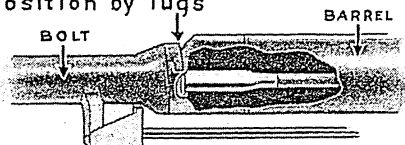


III. GAS FROM THE BARREL STARTS PUSHING BACK A PISTON AND ROD

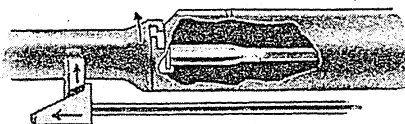


IV. THE MOTION OF THE ROD UNLOCKS THE BOLT AND MOVES IT BACK

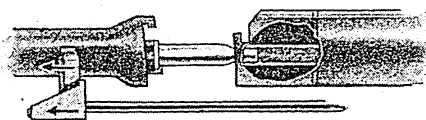
1. During firing, the bolt is locked in position by lugs



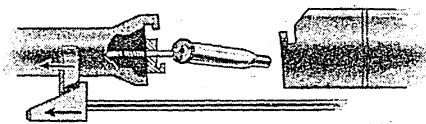
2. Backward motion of a cam on the end of rod turns up the bolt and unlocks it



3. Continued backward motion of rod carries bolt back and extracts empty case

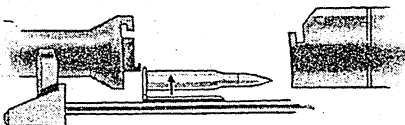


4. When the cartridge case is free, a spring-driven ejector knocks it from the gun

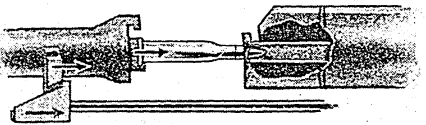


V. WHEN THE FORCE OF RECOIL IS SPENT, THE BOLT RELOADS THE GUN

1. Once the bolt is fully back, a spring pushes a new round into position for loading



2. A spring, which was compressed by recoil, drives the bolt forward into firing position



These drawings show the operating principles of the semiautomatic Garand rifle of the United States military forces. The rifle weighs about nine pounds, the same as the older Springfield, but it reloads automatically after each shot, until the clip of eight cartridges is exhausted. The reloading is done by using the power of the exploding gas which drives each bullet. Unlike sporting automatic rifles, which use the gas to work the breech mechanism directly, the Garand rifle uses the gas in a cylinder near the muzzle. In the drawings, details have been simplified considerably. For example, the bolt is shown as being pushed back after it has been unlocked. Actually, it is moved by an accelerator, similar to the one used in the machine gun (see Machine Gun); but the

mechanism is too small and too complicated to be shown here. When the last shot has been fired, the bolt locks open, warning the soldier to insert another clip. The Garand fires .30 caliber cartridges, as does the Springfield. On the average, it is five times faster than the Springfield, and in expert hands it is capable of firing 80 or 100 aimed shots a minute. It is also more accurate, for it permits the rifleman to keep his aim steadily on the target; whereas with the Springfield he has to take fresh aim for every shot, after operating the bolt to eject the used cartridge and put in the new cartridge. It has less recoil, and so can be used with less fatigue. The rifle is named for its inventor, John C. Garand, a gunsmith employed in the government armory at Springfield,

.30 caliber repeating rifle used in the United States Army at the present time.

Deadly at Three Miles' Range

It remained only for the arrival of smokeless powder to bring rifles to their present height of shooting power (see Explosives; Gunpowder). The increased pressure of the new powder, however, caused the old soft lead bullets to jump the rifling, and so brought about the invention of the hard metal jacket for bullets. This jacket, usually composed of an alloy of copper and nickel, gives the bullet so secure a hold on the rifling that a much sharper twist is given, imparting to the bullet a much more rapid spin. This, in turn, makes possible the use of longer and narrower bullets, which can be driven to great distances at high speed. The Springfield rifle of the United States Army shoots a spitzer or sharp-nosed bullet of .30 caliber (30/100 of an inch in diameter), with a muzzle velocity of 2,700 feet a second. It is exceedingly accurate up to a mile, and it has killing power up to three miles.

In the first World War the American army could not be supplied with this weapon in the numbers needed, because most arms factories had been equipped to fill orders for British Lee-Enfield rifles. The army met the situation by ordering rifles of the Lee-Enfield type, modified to use Springfield ammunition.

During the war the army also developed a satisfactory *automatic* rifle. In this gun the back pressure from the exploding charge operated a mechanism which ejected the empty cartridge, reloaded, and fired. This action continued as long as the soldier kept the trigger pulled, until the supply of 40 rounds had been fired. Such automatic rifles are often called light machine guns (see Machine Gun).

Since 1938, the United States Army has been gradually equipping troops with a *semi-automatic* rifle. This weapon has a clip of eight cartridges and reloads automatically, but the soldier must pull the trigger for each shot. He is not distracted, however, by having to work a bolt, his aim is not disturbed, and he can fire five times more rapidly than with the older weapon.

The military spitzer bullet cannot be used for big-game hunting, because it penetrates too easily and does not have sufficient shocking or stopping power. To provide this power, a *dum dum* bullet is used. This bullet has a point of soft metal, with a hard-metal casing extending nearly to the point. Such a bullet spreads out or "mushrooms" when it strikes, and inflicts a wound which is almost sure to bring down the animal or to kill it if it is hit near a vital spot. By common agreement among civilized nations, the use of dum dum bullets in warfare is prohibited.

History of Pistols and Revolvers

The early pistol was simply a gun small enough to be fired with one hand. Its development followed step for step that of the musket. From the huge "horse-pistols" nearly two feet long to the tiny vest-pocket weapons of the "derringer" type, they passed

through the same stages as their larger relatives—flint-lock, cap and ball, and cartridge. Many were double-barreled, while the "pepper-pot" variety common in Civil War days had from four to eight barrels arranged in a circle. The highest development of these early side-arms was achieved in the duelling pistols, which were often richly adorned with silver, gold, and jewels, and were made with watchlike precision. None of the smooth-bore pistols were of much use except in hand-to-hand fighting. The horse-pistol carried by cavalymen was often employed as an effective club after it had been fired once at close range.

The first great departure in pistol-making came with the invention of the revolver. The principle of the revolving cylinder containing six charges of powder and ball which could be fired in rotation through the same barrel had proved unsuccessful in the Colt rifle mentioned above, but won instant popularity when applied to the smaller weapons. The Colt revolver of the cap-and-ball type which came into use during the Civil War was soon replaced by the .45 caliber cartridge "six-shooter," which achieved everlasting fame as the constant companion of plainsman and miner of frontier days.

The double-action (self-cocking) revolver, in which the hammer is cocked and released and the cylinder rotated by a single pull on the trigger, soon took the place of the single-action weapon, which had to be cocked by hand. This weapon, firing smokeless powder cartridges with "soft-point" bullets, has become a standard pocket arm.

The self-loading or automatic pistol, however, bids fair to replace the revolver entirely in military and private use. Capable of firing from eight to ten shots with extreme speed, it is superior in mechanical principle to the revolver, for in the latter there is always imperfect alignment and gas-leakage at the junction of the barrel and the revolving cylinder.

Shotguns, Ancient and Modern

As early as 1580 fowling pieces seem to have been made for the purpose of shooting at flying birds. Blunderbusses, with yawning barrels loaded with small shot or bits of metal and stone, were used as "scatter-guns" in battle, or for defending stage-coaches from highwaymen. Out of these grew the modern shotgun, whose development followed closely that of the musket and rifle.

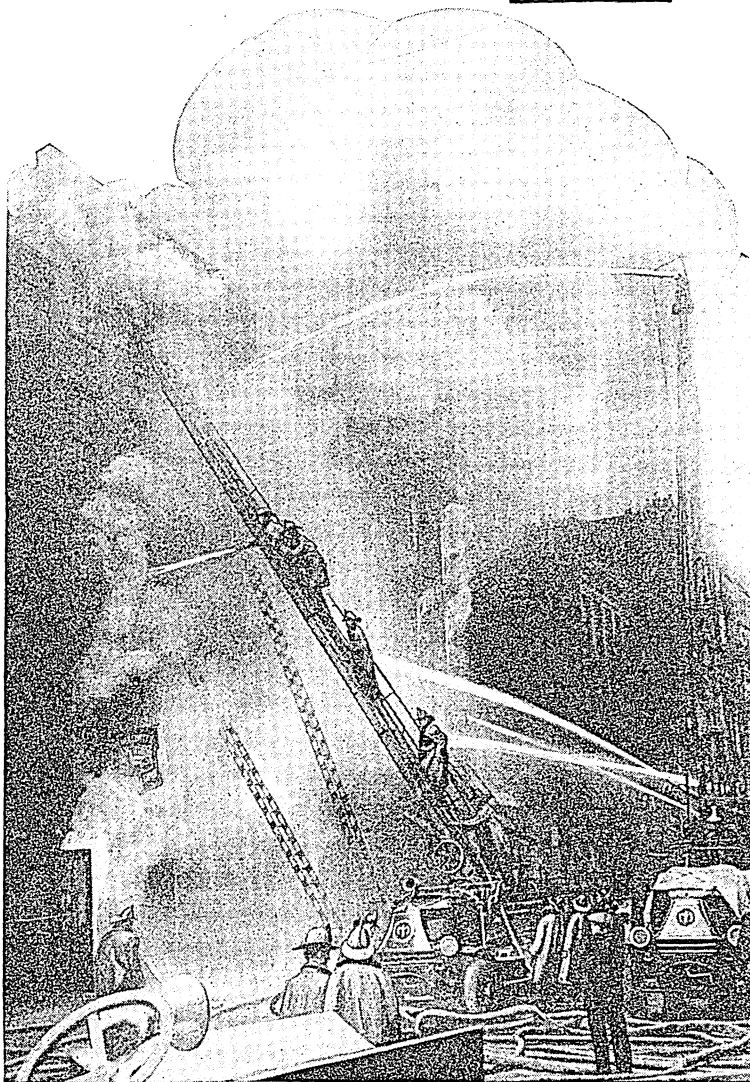
Modern shotguns have barrels ranging in size from 8-gage to 24-gage, a system of measurement which has come down from the days of the musket. The standard 12-gage gun, for instance, is one whose barrels are large enough to accommodate a round leaden ball of such a diameter that 12 of them would weigh a pound.

Shotgun cartridges for breech-loaders, usually made with a brass base and paper sides, may be loaded with any size shot, from the tiny pepper-shot used on small birds to the heavy buckshot with which deer and other large animals are killed. Although chiefly a

hunting weapon, sawed-off shotguns with buckshot cartridges form part of the equipment of express messengers and others who have to guard large sums of money and other valuables. During the World War American infantrymen made some use of them in trench raids. They have also been the favorite weapons of criminals for ambushing victims at close range.

"Choke-boring," by which the barrel is made slightly narrower at the muzzle, causing the shot to

fly in a closer group and thus be more effective at long range, is the chief device which has improved the shooting qualities of these guns since the days of the old fowling pieces. The standard double-barreled shotgun is often made with one "choked" barrel and one open. Single-barreled pump-guns and self-loaders have also been successfully developed. The average working range of shotguns is from 15 to 40 yards, depending on the shot and powder used.



Through Flame and Smoke with the FIRE FIGHTERS

paper tape. These dots give the number of the street corner from which the alarm comes. Or a call may come from headquarters over the telegraph. Or an excited citizen may call directly by telephone. The ticker and the telegraph instructions give information in connection with a card catalog system, which is so complicated that firemen must study six months to master it. They must know when to respond to a fire outside the district which they regularly serve, if the fire is serious.

FIRE DEPARTMENT. Do you know how quickly a fire company can go to a fire? Let us visit a city engine house some night when an alarm is turned in. Two or three men are on duty near the alarm apparatus. This is the night watch. Overhead, most of the firemen are asleep, half-dressed, in a big room full of cot beds.

Suddenly a little machine, enclosed in glass, rings a bell and begins ticking off a series of dots on a

If the alarm received makes a call upon their engine house, the crew comes to life very rapidly. The sleepy firemen jump into boots with trousers attached, slide down a brass pole, through a manhole in the floor, land with a bounce on a rubber pad, slip into rubber coats and helmets and run toward the engine truck. This engine, in modern equipment, has pumps operated by the truck. With a hook and ladder wagon, the battalion chief's car, and perhaps an insurance patrol car, it makes a red streak to the scene of the fire, and soon has streams of water playing over the burning building. The firemen run up stairs and ladders to bring out people in danger. They are strong and brave. Some of them can carry four people at once, by hooking children on their belt! They climb on dizzy window ledges and cross slippery roofs. They make bridges

WHEN THE ALARM RINGS!

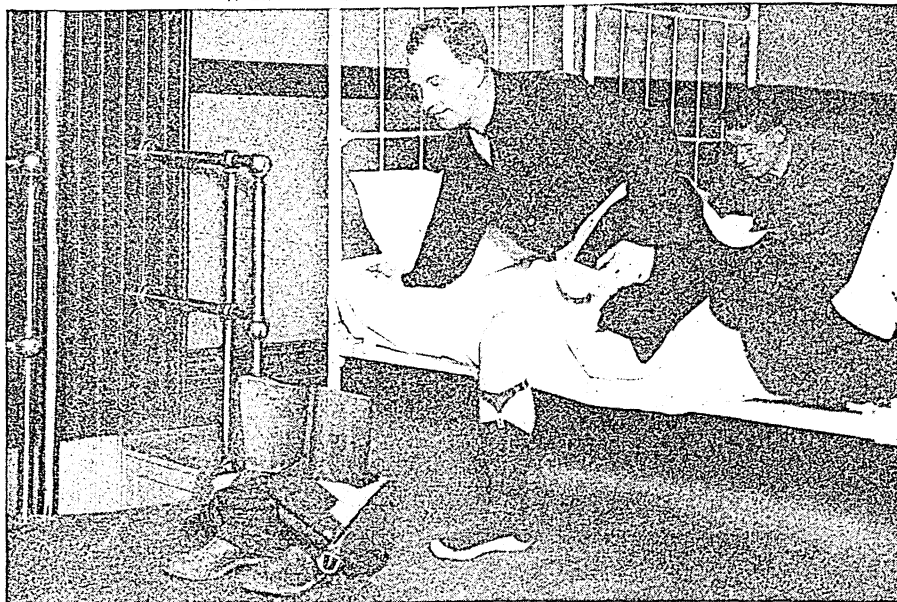
across alleys and courts with ladders; they hang over roof cornices. Firemen every day do deeds of daring that you would think impossible.

These brave fire-fighters are often killed, or injured for life. Burning shutters, cornices, and awnings fall upon them. Sometimes a roof falls in with them, or an explosion blows up a building. In winter the water freezes as it falls on them, so that often the boots and gloves of the firemen are frozen. Sometimes a fire company has to stay out 36 hours. Firemen never leave a spark, as careless campers often do, to start a new fire.

It is very important that the fire-fighters reach the fire quickly. In the early days messengers ran through the streets calling "Fire!" or a central alarm bell was rung, as is still done in villages and small towns. The volunteer fire-fighters tumbled out helter-skelter, and much time was lost in finding out where the fire was. Then cities were divided into districts, and when the fire-bell rang a man on a high tower indicated, by flags in the daytime and by lanterns at night, in which district the fire was. Later electric telegraph signals were used, and bells in the engine-houses rang the number of the box from which the alarm was sent.

In a modern system the engine-houses in the various districts of the city are connected by telegraph with a central room at the fire department headquarters. A chief operator or his assistant is always on the watch in this central room, which is the nerve center of the entire system. Fire alarm boxes, painted red to attract attention, are located on street corners, and each box is connected by telegraph circuits with a large instrument board placed in this central room.

To give an alarm, a person pulls open the door of the nearest fire box. This sets a gong ringing, which is the "telltale bell" to guard against the sending of false alarms by mischievous persons, "just to see the engines run." Then the sender pulls down a small lever in the box and releases it. This starts a telegraph instrument inside the box, which ticks out the number of that particular box, indicating it on the instrument board at headquarters by the flashing of a light and the ringing of a small bell.

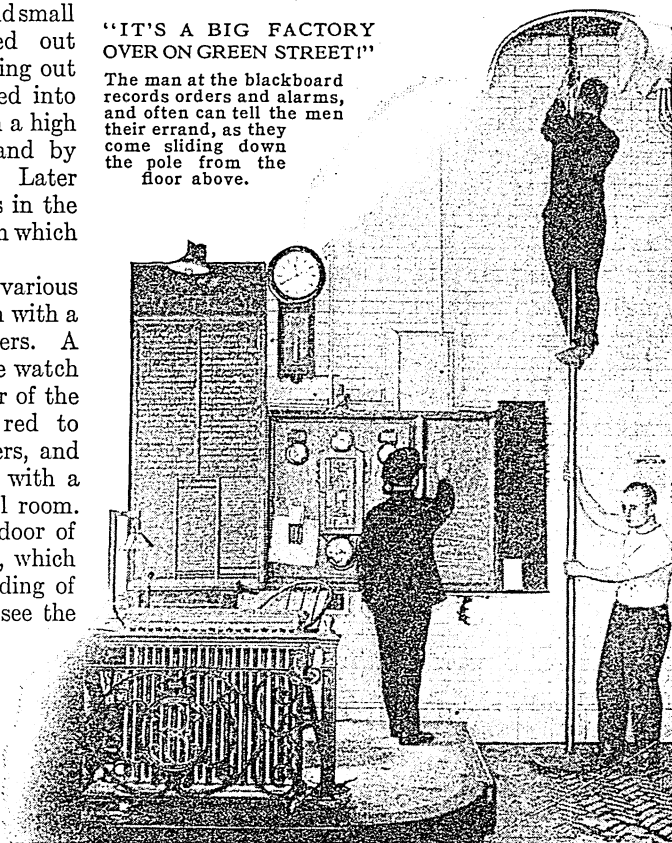


Even before he is fully awake, the fireman is tumbling out of bed. The next instant he has drawn on the boots which are already thrust through the legs of his trousers. A second later, his belt is buckled and he is sliding down the pole in the corner to the floor of the engine house below. Coat and hat are donned after the engine has left the building, for even at night the engine is often on the way in less than one minute from the first tap of the warning gong.

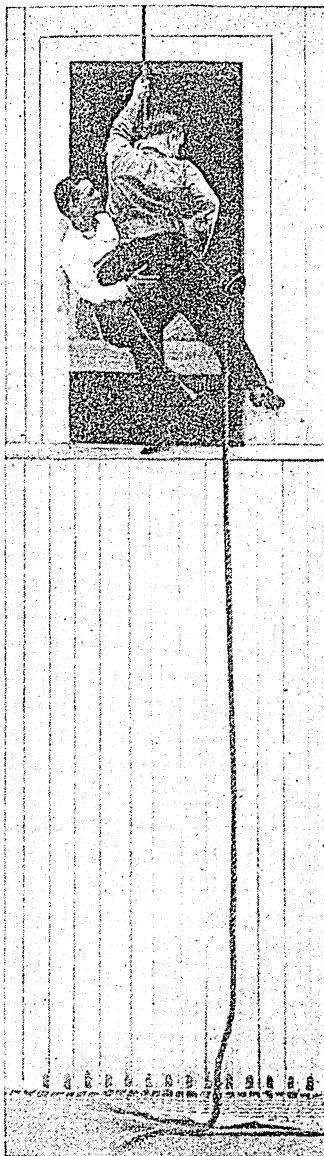
The signal is repeated several times to avoid error. In drawers near at hand are small metal disks, one for

"IT'S A BIG FACTORY
OVER ON GREEN STREET!"

The man at the blackboard records orders and alarms, and often can tell the men their errand, as they come sliding down the pole from the floor above.



SLIDING TO SAFETY



Firemen learn to use their belt and rope so well that they can carry 400 pounds in addition to their own weight in a descent to the ground.

dollars or more. A succession of them may help to produce carelessness, or decrease that efficiency which is the pride of every great department.

Many of the modern fire departments had their beginning in the little volunteer bucket brigades of the early days. With the growth of cities and the development of complicated apparatus for fighting fires, it became necessary to have paid and specially trained firemen. Firemen are chosen because of their courage and mental alertness, as well as their physical

each box, numbered to correspond to the street box numbers and arranged in order. The headquarters operator selects the disk bearing the number of the box from which the alarm was sent and places it in a slot on a large telegraph instrument; and this in turn immediately ticks out the number over circuits leading to the fire stations concerned.

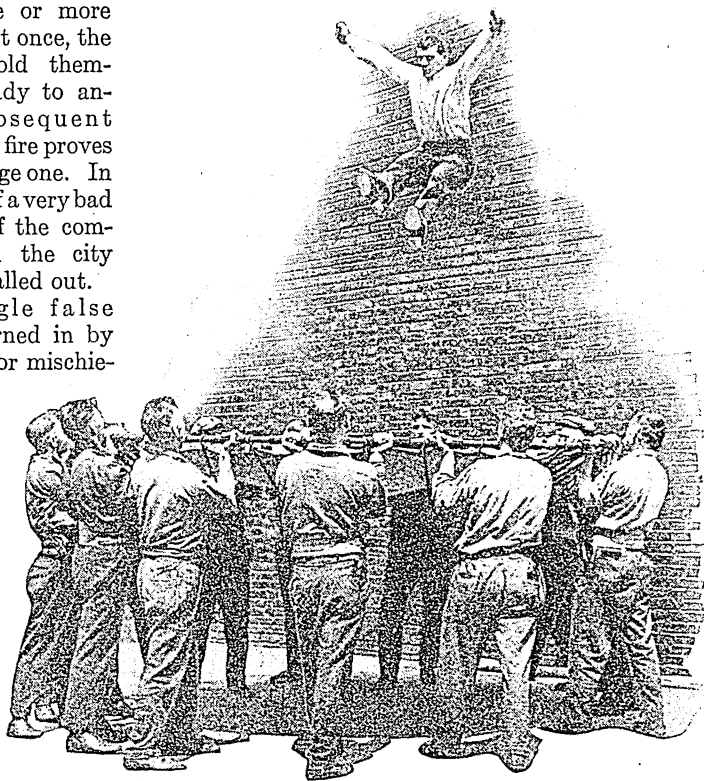
In each of the fire-stations a little bell called a "joker" taps off the signal and within 90 seconds or so the company is on its way. A number of companies may have received the call, and while one or more dash off at once, the others hold themselves ready to answer subsequent calls if the fire proves to be a large one. In the case of a very bad fire, all of the companies in the city may be called out.

A single false alarm turned in by a foolish or mischievous person may cost the city a hundred

strength, endurance, and agility. The recruits are trained and disciplined somewhat as soldiers are, for they must learn to work together efficiently under their officers. Each fire company has a captain and lieutenants, and the companies are usually grouped into battalions under battalion chiefs. At the head of the whole city organization are the fire chief and his assistants. Besides engines, hose-carts, hook-and-ladder trucks, and the like, many cities have powerful fire-tugs for fighting fires along the waterfront and among the harbor shipping.

Machines for extinguishing fires were in use in very ancient times. Large squirts or syringes worked by hand were used at first; and later hand-pumps with hose attached were placed on wheels to be drawn to the fires; they pumped water from nearby reservoirs. The largest of these hand-pumps required 40 or 50 men to haul them to the fires and operate them. Then steam fire-engines were invented, which were drawn to the fire first by horses and later by motors. The motors which take the apparatus to the fire may also be used to pump the water from cisterns or reservoirs. In the modern city water systems the water is often distributed under sufficient pressure by the waterworks to give a powerful stream when a hose is attached from the hose-cart directly to the

WHEN ALL ELSE FAILS—THE NET!



Firemen are always thoroughly drilled in the use of their last resource for saving life from a burning building—a net in which they catch people jumping from the upper stories. Here you see a fireman playing the perilous rôle of the victim to give his mates practice.

THE TWENTIETH CENTURY "RESCUE SQUAD"



Equipped with oxygen helmets, these men rush into smoke-filled buildings to rescue people who have been overcome. They also have a pulmotor, shown in the foreground, with which to revive smoke victims.

fire hydrant. Modern fire departments are also equipped with "chemical" engines which throw streams of fire-extinguishing liquids and gases suffi-

cient to put out small fires. The modern fire department is concerned with fire prevention as well as fire fighting. Men from the department make regular inspections to see that fire prevention regulations are obeyed. Buildings in thickly settled districts must be of materials classed as fireproof. Burnable waste must not be allowed to accumulate in buildings and alleys. Watch is kept against the careless use of matches, and over the storage and use of inflammable and explosive materials. Fire escapes and exits must be kept ready for use, and automatic sprinkler systems, fire hose, and chemical apparatus must be provided in large buildings and plants. Such regulations have greatly reduced fire damage in large cities.

How We Can Aid in Fire Prevention

THE best time to put out a fire is before it starts. That means, of course, don't let it start! But how, you ask, can we give any real help for fire prevention? First of all, by a study of your own habits. What little careless things do you do that might permit fires to start? For it is carelessness that causes the vast majority of fires. Although the loss from fires in the United States is being gradually reduced by the construction of fireproof buildings and other protective measures, fires still cause an annual property loss of more than \$250,000,000 and bring death to some 10,000 persons and injury to thousands more. The tremendous fire loss and the cost of fire departments fall on all citizens in the form of taxes, insurance, higher rents, and higher prices for goods and services. The fire loss alone is about \$2 per capita each year. So is it not worth while to help prevent fires?

We should all share the responsibility of cutting down fire losses by following the rules given below.

Matches. Always strike a match in a direction away from you. Be sure the match is out before you throw it down. Keep matches in a metal container, out of the reach of children, and away from heat. Do not carry matches loose in your pocket. "Matches don't think with their heads; so *your* head must think for them. Put them out."

Lights. If you use candles, be sure they will not overturn. Keep them out of drafts and away from anything that might catch fire. Have metal lamps, with solid, heavy bases. Be sure the wicks fit snugly and are kept trimmed evenly. Fill the lamps in daylight, with best quality oil. See that caps and burners are tightly screwed in place. Keep lighted lamps out of reach of children; if on a table, do not have a cloth hanging within reach of a baby or a dog. Have no gas flames without globes. Never use paper lighters.

Stoves, Furnaces, Fireplaces. Have stove and furnace set as far as possible from woodwork. Protect nearest woodwork by sheet asbestos, iron, or tin, with an air space behind iron or tin. Keep all pipes and flues in good repair, free from soot. Never kindle a fire with kerosene. Do not let stoves, furnaces, or pipes become red-hot. A strong high fire-screen should be kept before an open fire. Do not burn loose papers in a fireplace. An open fire should not be left burning over night or when no one is in the house.

Cooking, Cleaning. Keep watch on all broiling and frying. Do not put water on burning grease; use earth, flour, salt, or a metal cover. Do not clean with gasoline or naphtha anywhere near a stove or flame. Keep oily waste in a covered metal can. Allow no rubbish to accumulate. Store gasoline, kerosene, or

SOME "DON'TS" FOR THE PREVENTION OF FIRE



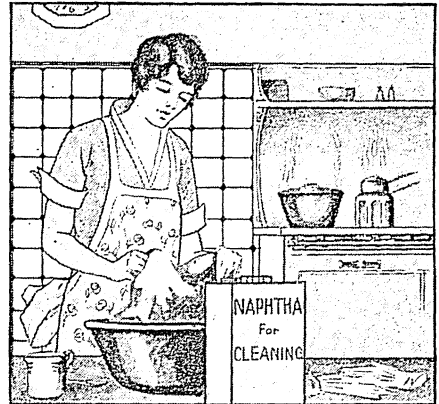
DON'T play carelessly with cannon crackers or other Fourth of July fireworks. Hideous mutilations, blindness, or loss of life occur throughout the nation on the "Fourth."



DON'T play with matches, especially near celluloid toys, as they burn easily. Matches are dangerous playthings. It is also a foolish household that leaves a trash basket beside the gas stove, ready to catch fire from an unextinguished match, or to let a bit of paper be carried by a gust of wind into the flame.



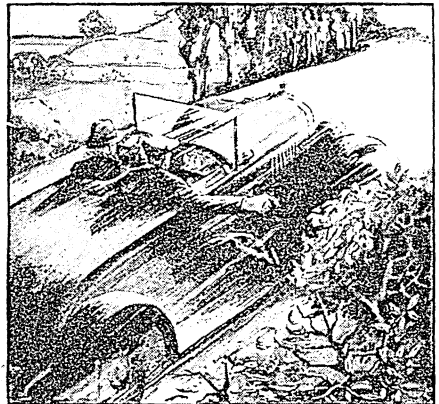
DON'T light your way in a dark closet, or in search of a gas leak, by the blaze of a match.



DON'T use inflammable cleaning fluids in a room with a fire burning. Most preparations for dry cleaning give off a gas which takes fire readily.



DON'T let the electric iron stand with current turned on while you engage in a long chat on the telephone. It is also a dangerous practice to loop electric wires over a nail, as the rubbing of the wire on the nail may remove the insulation and start a fire.



DON'T let anyone drop a lighted cigarette along the highway. It may set a fire in dry grass or brush which will destroy a forest.



DON'T leave the least ember alive in your camp fire when you break camp. Put it out thoroughly with water as these boys are doing, and help save the forests.

other oils outside house and garage, in tight cans. Smother a gasoline fire with a blanket or a coat.

Gas, Electricity. Do not look for a gas leak with a match, a lamp, or a candle; use an electric flashlight. Turn off current for sweeper, iron, toaster, or other apparatus, when not in use. Do not use rubber tubing for gas connections. All electric wiring in the house should be in metal conduits. All wiring should be done by an expert. Do not hang extension cords on nails or metal hooks.

Smoking. Never let anyone throw away lighted cigars or cigarettes; *put them out*. Do not allow smoking in a garage, or in a car when the tank is being filled. Keep a watch on careless smokers.

Holidays. There is no vacation for common sense. Have a good time today, but be careful so that you can also have a good time tomorrow. Fireworks should be handled only by grown people. Do not use cotton-wool or candles on Christmas trees.

Miscellaneous. If you must have bonfires, keep them far enough away from other inflammable material to avoid all danger. Be sure bonfires and camp fires are absolutely out before you leave them. Do not permit children to play around unwatched fires. Keep all celluloid articles away from flame and heat.

Keep the small fire from being a big one. With the other members of your family, plan just what to do in case fire should break out in your house. Most fires can be put out in the first five minutes, if you know what to do, and act promptly. An approved fire extinguisher is the best weapon. A small fire can be smothered. You know fire cannot burn without air. If your clothing catches fire, roll yourself in a rug or heavy bedclothes. If out of doors, roll on the ground. A boy's or man's thick coat will often put out a small fire. Pull down a blazing curtain and smother the flame. Throw a mattress on a burning floor. It is generally best to throw water on in small quantities; aim at the base of the flames.

If a fire starts say to yourself: "I'm not going to get excited, I'll keep my head." *The first five minutes at a fire are worth more than the next five hours.* One steady-nerved person who knows just what to do and does the right thing promptly can often quench a fire at its beginning, thus preventing possible great loss. Of even more importance is his example upon excitable and panicky people.

A 12-year-old boy was in a theater when some one yelled "Fire!" This boy was accustomed to fire drills in his school, and he kept his head. Jumping on his seat, he calmly began to shout "Left, Right, Left, Right, Left, Right!" He went on till those nearest him in the pushing crowd caught the rhythm and unconsciously fell into step. Then others took up the "Left, Right, Left, Right!" Soon the entire audience was affected: women stopped screaming, the mad scramble gradually ceased, and the people in marching lines passed out of the building safely.

Great fires which nearly wipe out whole cities have become increasingly rare, as better methods of fire prevention

and fire fighting have prevailed. But formerly fire was one of the great scourges of large cities all over the world.

In 1666 the Great Fire of London lasted three days and consumed buildings on 436 acres, causing a loss of approximately \$50,000,000. In Moscow 18,000 houses were burned in 1752. One of many fires in Constantinople occurred in 1729, destroying 12,000 houses and 7,000 lives. Copenhagen was nearly destroyed in 1728, and in 1842 a fire lasting for 100 hours destroyed more than 4,000 buildings in Hamburg, Germany. Most of the famous old city of Smyrna, Turkey, was burned in 1922.

One of the most devastating fires in the United States was the great Chicago Fire of 1871, which consumed buildings covering more than 2,000 acres, representing a property loss of \$185,510,000. More than 200 lives were lost and 98,500 people were homeless. In the following year, fire destroyed the richest section of Boston. At an earlier date, in 1849, 15 business blocks along the river front of St. Louis were burned, together with 23 steamboats. In 1866, half of the city of Portland, Maine, was ravaged by fire. In 1904 most of the business district of Baltimore was destroyed by a two-days' blaze. In 1906 four square miles of San Francisco, Calif., were devastated by a fire that followed an earthquake. Hundreds of lives were lost and the property loss was estimated at from \$200,000,000 to \$500,000,000.

FIRE-EXTINGUISHERS, CHEMICAL. Certain gases, especially carbon dioxide (carbonic acid gas), "smother" a fire just as water quenches it, by cooling it and by preventing it from getting the oxygen which it needs in order to burn. Most chemical fire-extinguishers are contrivances for generating such a gas quickly and directing it upon the fire.

The soda-acid type of hand extinguisher contains a solution of bicarbonate of soda, with a loosely stoppered bottle of sulphuric acid. When it is turned upside down the acid acts on the soda to form carbon dioxide gas.

The foam extinguisher uses aluminum sulphate instead of sulphuric acid, and a gluey substance (a colloid) is added to the soda solution. These liquids create a foam consisting of millions of tough little bubbles of carbon dioxide gas which cling to the burning surface and cut off the air.

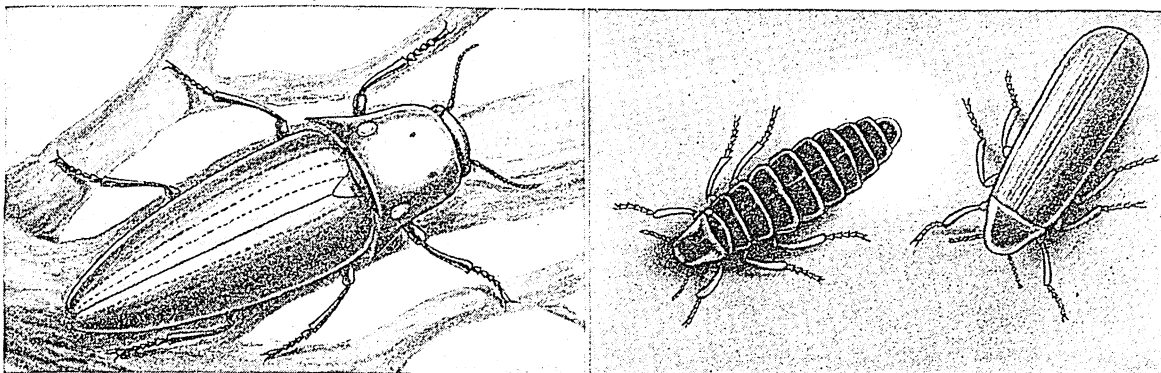
Another type contains liquid carbon dioxide under pressure. This expands to 450 times its original volume when released and hence is valuable around electrical equipment, since it reaches even the most inaccessible places.

Carbon tetrachloride extinguishers are also useful around electrical equipment, since this fluid does not conduct electricity. The vapor from the liquid cools the burning surface and dilutes the oxygen of the air.

Chemical fire engines are applications of these same devices, on a larger scale. Their special purpose is to put out fires in chemicals or electrical equipment, where water is ineffective, and to put out small blazes without damage by water.

FIREFLIES AND GLOWWORMS. The most efficient lighting system in the world is that possessed by the fireflies and glowworms with their "phosphorescent" lights. If you hold your hand near an electric light, a gas light, or an oil lamp, you feel a lot of heat escaping. That heat is wasted energy, an expensive loss. But the firefly has a mysterious way of producing light so that it is virtually all light and no

INSECTS THAT PRODUCE LIGHT WITHOUT HEAT



With all his science, man cannot duplicate the feat of these little beetles that produce so-called "cold light"—that is, light which does not depend upon heat for its origin. The one on the left is the cucujo or firefly of Brazil, while the two insects at the right are European glowworms. The female is wingless and carries the light, which she uses as a signal to her flying mate.

heat. Scientists are striving to produce "cold light," like that of the firefly, in the hope of making our lighting systems many times more efficient than they are at present.

Fireflies—which are not "flies" at all, but members of the beetle order—have been objects of wonder and romantic stories in all ages. Flitting about on warm evenings, or creeping in the damp grass, these "living stars" with their pulsating light produce a weirdly beautiful effect.

Certain large and brilliant fireflies of tropical America, called "cucujos," are captured by the natives and kept in wire cages, where they are fed on sugarcane and bathed twice a day in tepid water. On festival nights they are sold to the young women of the region, who thread them together and weave them in their hair or fasten them to their ball gowns, to glow there like flaming jewels. The ancient Aztecs are said to have confined large numbers of these insects in fine-meshed baskets, which were used as lanterns on night journeys. In Japan the sport of hunting fireflies is a popular pastime. Kept in tiny cages, they ornament the home and garden, and many dealers make a business of selling them.

The glowworm, also, which is chiefly a native of Great Britain and northern Europe, is a beetle. The female is wingless and crawls about on the ground at night devouring snails and other small creatures. She alone possesses a lantern, which consists of paired masses of fatty tissue beneath the skin on the under side of the abdomen, and she uses her light to signal to her flying mate. It is of this beetle that the ghost in Hamlet speaks when he says:

The glowworm shows the matin to be near,
And 'gins to pale his uneffectual fire.

Naturalists have criticized Shakespeare for these lines, pointing out that he should have used the feminine "her" in referring to the glowworm, and that the light is by no means "uneffectual."

Among the true fireflies or "lightning bugs," as they are often called, both males and females have wings and lanterns. Besides their use as signals to

draw the sexes together in courtship, the lights are believed by some to be a warning device. Birds, bats, and other nocturnal creatures soon learn by experience that the "bug with the fireworks" is unpleasant to the taste, and thereafter they leave it alone.

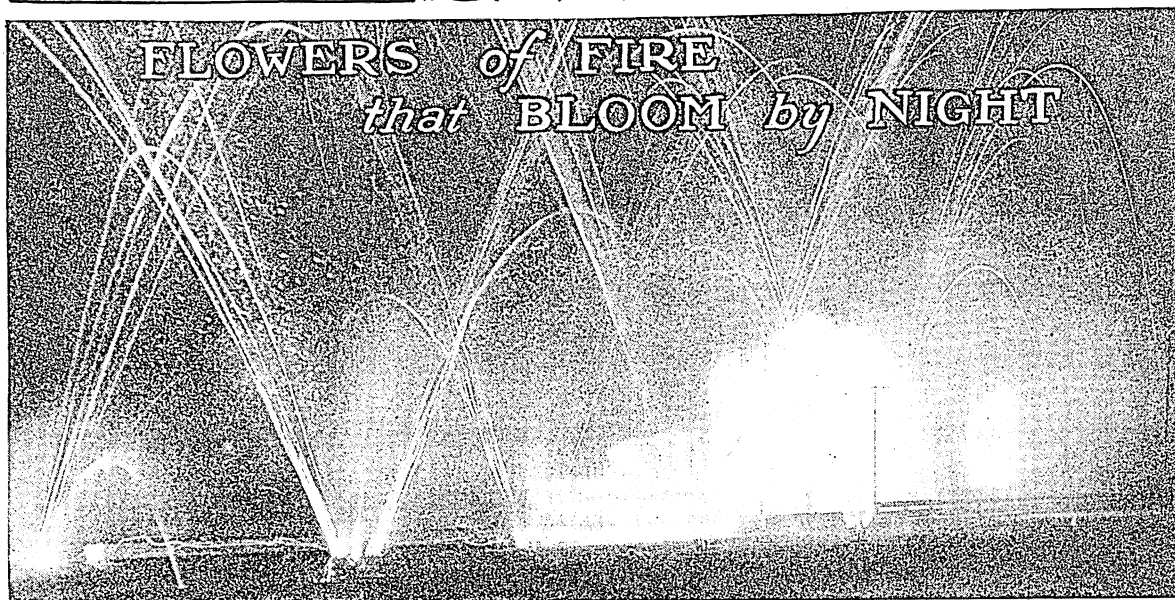
The fuel in the firefly's lamp is a substance named *luciferin*, which consumes oxygen and so generates light. To speed the process, *luciferase*, a catalyst, is necessary. When luciferin is burned, it is not gone forever; instead it is changed back to its former state, and the firefly is ready to produce another flash. (See Phosphorescence.)

The fireflies found in the United States, as well as the European glowworms, are not more than half an inch long and belong to the family called *Lampyridae*. The "cucujo" of tropical America sometimes reaches two inches in length, and is a relative of the click-beetles, belonging to the *Elaeteridae* family. Certain luminous centipedes are often mistaken for glowworms.

FIREPROOFING. When we say that a building is "fireproof" we mean that it is built of steel, stone, brick, cement, or some other non-combustible material; or more often that it is only slow burning because of slate or tile roofs and asbestos linings, or is made of wood that has been chemically treated with silicate of soda or borax or phosphate of ammonia. Wood so treated will stand terrific heat, though it will ultimately burn or char.

Cloth also can be rendered fireproof. The same Englishman who made the first coal-tar dye, Sir William H. Perkin, made many experiments in trying to make flannel resistant to flame. He succeeded so well that the heat of a match is scarcely sufficient to ignite a piece of flannel treated by his method. The process consists in dipping the cloth in a solution of different chemicals so that an insoluble compound of tin is formed, or precipitated as a chemist would say, right in the fiber of the goods. Sodium tungstate is also used instead of the tin compound.

The scenery for stages, together with the curtain and other stage properties, are usually rendered as nearly fireproof as possible, because the danger of fire is particularly great in theaters. (See Asbestos.)



FIREWORKS. China is believed to have been the birthplace of fireworks. There and in India they attained high perfection. When gunpowder was introduced into Europe, fireworks also came into use. As early as 1540 they were manufactured in Italy, and during the 17th and 18th centuries fêtes were held in which fireworks were used.

But the blaze of fireworks which constitutes such an important part of festivities in Europe and America today was absent a century ago. National holidays were celebrated merely by cannon salutes and bonfires. It was not until the middle of the 19th century that the use of fireworks became general. Today the United States leads the world in pyrotechnics, which is the scientific name for fireworks. Marvelously complicated and beautiful set-pieces are made, such as fiery fountains, portraits, lettered designs, and other elaborate pieces, usually fired by electricity.

The brilliant colors of fireworks are due to certain bright-burning chemicals such as sodium, which gives a deep yellow color; calcium, which gives red; strontium, crimson; barium, green; and copper, green and blue. Iron filings, which glow brightly under intense heat, are usually used to create the showers of brilliant sparks. In all fireworks there must be the "starting powder," which first catches

FIGHTING OFF PIRATES WITH FIREWORKS

The American brig *Independence*, commanded by Capt. Decimus Forthridge, lay becalmed off the island of Sumatra. It was loaded with a cargo of fireworks, for this was in the year 1840, when China manufactured most of the fireworks of the world.

In the mid-watch of the night came the terrifying cry, "Pirates! Pirates!" All hands swarmed on deck, only to find that no ammunition was available. The murder of the crew and the plundering of the ship seemed inevitable, for two war proas (Malay sailing vessels) were close at hand, filled with dark-skinned cutthroats.

The captain, in desperate desire for action, tore open a box of fireworks and began setting off Roman candles and rockets over the moonlit waters. The pirates stopped, perplexed, and when the leader of one of their vessels was hit by a ball of purple fire, they drew off.

A third proa had crept up unobserved and the pirate crew were stealing up the anchor chains. At this instant the paper wrappings of a box of fireworks blazed up by accident. Captain Forthridge seized it, carried it to the rail, and dropped it into the boat of the attackers. It broke open and the fireworks caught fire. Roman candles spat flame; rockets exploded in every direction; firecrackers popped with terrific noise about the bare legs of the pirates; and pinwheels whirled their fiery sparks about! The Malays went overboard as one man, preferring to take their chances with the sharks. A breeze opportunely came up at this moment, and the Yankee brig sailed jauntily away, leaving the frustrated enemy to nurse their burns as best they might.

fire; the "bursting powder," which causes the final explosion, and the "quick match," which leads the spark of fire from one point to another.

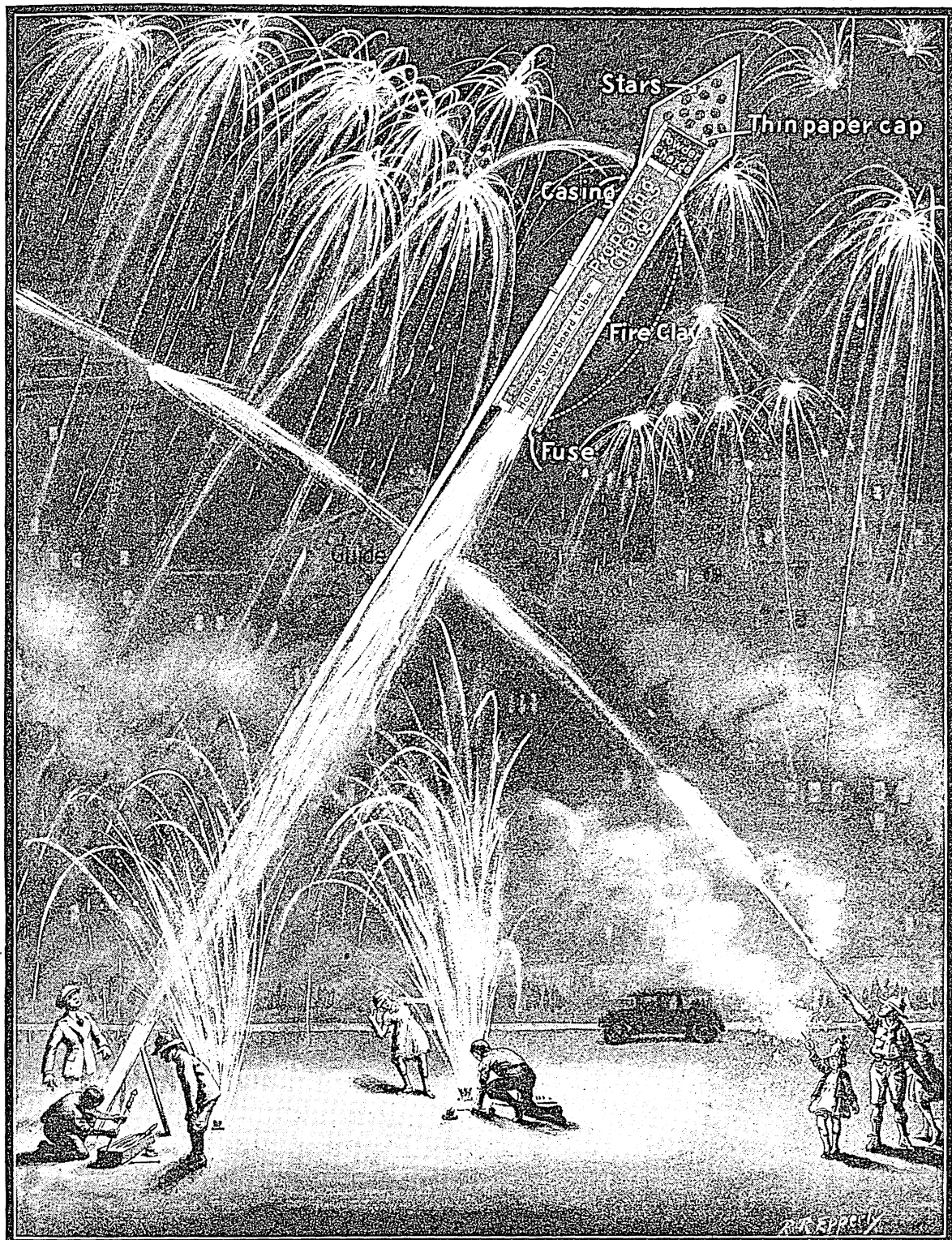
Resin, soap, camphor, gum, and such substances modify the character of the discharge. Metal filings added to the powder, and an air space between the charge and the case, give firecrackers their loud "bang."

Fireworks which soar into the air gain their momentum from the sudden discharge of the gases of explosion. The stars in Roman candles are hollow balls, made of gunpowder ingredients mixed with light-giving materials, pressed into shape with the aid of gum and shellac, and resting on layers of loose

granulated gunpowder. These balls are evenly distributed in the cardboard case, the spaces between being filled with a closely compacted mass of slow-burning material. Pinwheels are made by coiling long paper tubes, lightly filled with an explosive composition, about a frame which can revolve freely on its axis. "Flower pots" use the Roman candle principle, but the piece itself sets on the ground.

Fireworks serve many useful purposes. Railroad trains carry "fusees" (red flares), to be placed behind stalled trains to avert collisions. Airplanes carry parachute flares to light the ground for forced landings at night. Rockets, Roman candles, and "Bengal" or colored lights long were used as signals between vessels

HOW THE ROCKET IS SHOT SKYWARD BY ITS TAIL



What sends the rocket roaring upward and scatters its beautiful stars across the dark night sky? The answer is easy. The body of the rocket consists of a hollow tube with a strong pointed cap. A plug holding a smaller tube fits into the bottom, confining the propelling charge of powder. When you light the fuse, the flame runs up and ignites this powder; and the gas of the explosion, rushing out the narrow opening, drives the rocket up. It was long thought that rockets shot up by pushing back against the air, but now we know they work better in a vacuum. Just as the propelling charge is exhausted, the fire flashes through a tiny hole at the top, igniting the powder which scatters the "stars." The stick guides the rocket in a straight line.

at sea and from ship to shore, and rockets still are used as signals of distress. During the World War advancing infantry detachments sent information to the artillery in the rear through rocket signals. At night "star shells" with parachutes attached to keep them aloft were fired from special guns to light up No Man's Land.

How a rocket propels itself is explained with the picture on the preceding page. This principle was experimentally applied to the driving of automobiles and airplanes by Fritz Opel in Germany. The "kick" of the explosives gave the vehicles extremely rapid

acceleration for a few seconds, but distances covered were short.

Efforts to construct rockets that could be sent to great heights and controlled in their flights have been made in the United States. At an experimental station near Roswell, N. M., Prof. Robert Hutchings Goddard of Clark University in 1936 launched a rocket that attained a speed of 700 miles an hour, but it carried only enough explosive fuel to reach a height of 7,500 feet. This fuel consisted of a liquid mixture of gasoline and oxygen. The direction of flight was controlled by a gyroscopic attachment.

WHAT TO DO Till the DOCTOR COMES

FIRST AID. Many a life has been saved and the seriousness of many an injury has been reduced by prompt and intelligent first aid. This means any emergency treatment you can give to victims of accident or sudden illness when a doctor is not at hand. Everyone should know and be ready to put into practice the chief rules of first aid, which include what to do and what *not* to do.

General Directions

The first rule is to keep cool. If you work quietly and speak in a low voice, you will win the confidence of others. Send someone for a doctor, politely ask bystanders to move back, and then decide quickly what treatment to give.

There are four conditions when immediate aid may save life—heavy bleeding, stoppage of breathing, poisoning, and severe shock. Treatment for these conditions (which will be described later) should come ahead of all else.

Do not move the victim of a violent accident until the nature of his injuries is known. If he has broken bones or is losing blood, you may do harm by lifting or carrying him. If his vertebrae are damaged, clumsy moving may bring paralysis or death.

Keep the patient warm. This is the best way to check the grave effects of shock. In cold or damp weather, you must take the risk of moving him gently to get coverings under as well as over him.

If the victim is conscious, speak to him cheerfully and confidently. Do not allow him to see his wounds or injuries, since this may aggravate the shock.

How to Check Heavy Bleeding

The average body contains less than five quarts of blood. The rapid loss of half this amount always brings death, and a much smaller loss may be fatal when it accompanies the shock of an accident. For this reason, the first thing to do is to discover and check heavy bleeding.

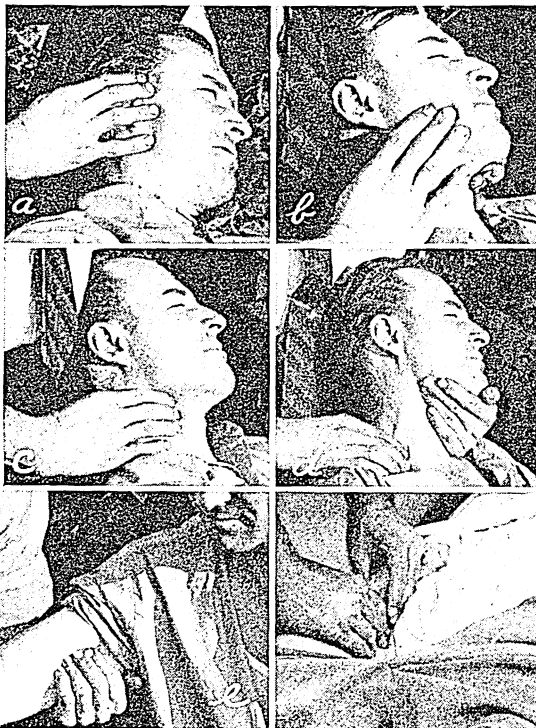
Quickly remove or cut away any clothing that hides the wound. If the blood is coming in strong jets in

time with the pumping of the heart, an artery has been punctured or severed. If the flow of blood is even, it is probably coming from a vein.

Bleeding from Arteries. This calls for the very swiftest action. Do not stop for bandages, but immediately apply finger pressure, as shown in Fig. 1. When you are pressing on the right point, the flow of blood will be checked. Do not be afraid to press firmly and steadily, even though you may cause some pain. If a doctor is

not likely to arrive soon, you must find a substitute for the pressure of your fingers, which will soon grow too tired to do their work properly. Bleeding from the small arteries of the scalp and face can usually be stopped by applying a tightly rolled or folded pad of cloth directly over the wound and

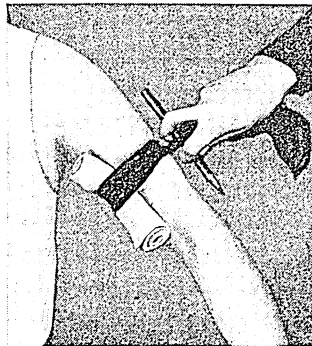
1. PRESSURE POINTS TO CHECK BLEEDING



Six points are shown above where finger pressure can effectively reach an artery and control bleeding. The areas they control are as follows: (a) in front of the ear for wounds in temple, forehead, and scalp; (b) along the jaw for face wounds; (c) at the side of the windpipe, pressing back against the spinal column for throat wounds; (d) behind the inner end of the collarbone, pressing downward for wounds in shoulder or armpit; (e) inside the upper arm for arm and hand wounds; (f) against the pelvic bone on the line of the groin for leg wounds.

holding it in place with a firm bandage around the head. Heavy bleeding from arm and leg wounds may require a tourniquet, as illustrated in Fig. 2. A cloth belt, a stocking, a necktie, suspenders, handkerchiefs knotted together, or a strip cut from the inner tube of an automobile tire may serve as a tourniquet. The

2. USING A TOURNIQUET



The necktie is wound around twice and knotted loosely, and the pencil is twisted in one of the loops.

tourniquet for leg wounds must be put around the leg about four inches below the groin, with the pressure pad halfway between the front and the inside of the thigh. Figure 3 shows convenient substitutes for a tourniquet when the wound is in the ankle or foot. The same device can be used for wrist or hand wounds by placing the pad in the hollow of the elbow and drawing the forearm and upper arm together. *Never keep a tourniquet tight more than 15 minutes at a time.* To do so may bring on gangrene. Loosen the tourniquet, and, if heavy bleeding begins again, tighten it once more.

Tourniquets cannot be applied to pressure points on the throat or behind the collarbone. Here finger pressure will have to be continued, with one person relieving another until medical assistance arrives.

In desperate cases when bleeding still keeps on, the wound will have to be packed. Tear gauze or muslin or any cotton cloth into narrow strips and, with the aid of some slender instrument like a pencil or the handle of a toothbrush, force the strips down one by one until the wound is tightly filled. Then apply a bandage that will draw the wound together around the packing.

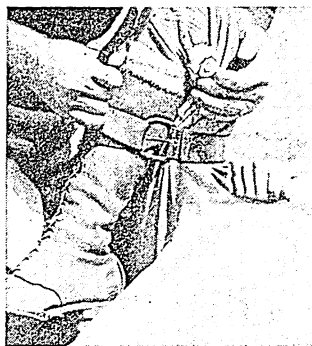
Anything that touches or enters an open wound ought, of course, to be sterilized. When this is impossible, use the cleanest material you can find. It is better to risk infection than to let a patient bleed to death. But in all other cases, the prime duty of the person giving first aid is to guard against the infection of wounds.

Bleeding from Veins. In the veins the blood is moving toward the heart. Therefore, when a large vein is cut, hand pressure or the tourniquet should be applied on

the side of the wound *away* from the heart. Then a pad or compress firmly bandaged over the wound itself will usually check bleeding. But wounds reaching deeply lying veins may have to be packed by the method described in the preceding column.

In all cases of heavy bleeding, the patient should be kept as quiet as possible, for exertion speeds up the heart action and increases the flow of blood. If the wound is in the neck or head, the patient should sit up; otherwise he should lie down with the wounded part raised above the level of the heart.

3. FOR A WOUNDED FOOT



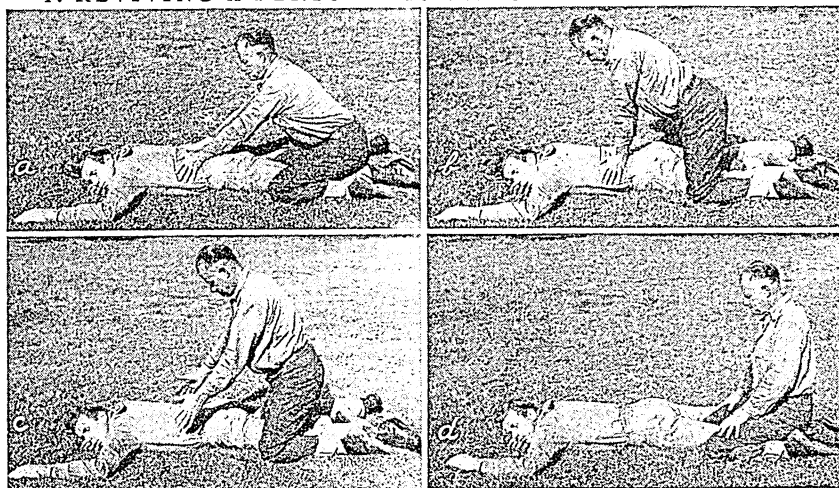
A roll of cloth is inserted in the bend of the knee and the lower leg is strapped tightly to the thigh.

them are drowning, electric shock, suffocation from gas or smoke, and overdoses of the narcotic and hypnotic drugs, such as morphine, ether, chloral hydrate, and barbitol or other "sleeping powders." After breathing stops, the heart may continue to beat for some minutes, though so feebly that it cannot be detected.

In such suspended animation or *asphyxia*, prompt use of artificial respiration may save the patient's life. Figure 4 shows the most effective method, called "the Schaefer prone-pressure method."

Patients have been revived by this method four hours or more after the treatment began. *So do not give up too soon.* Keep the rhythm of the movements slow and regular. When one helper grows tired, let

4. REVIVING A PERSON WHO HAS STOPPED BREATHING



Put patient's right hand under his cheek and stretch out his left arm as illustrated. Then, straddle his legs and begin counting at intervals of about a second: *one*, place hands as shown (a); *two*, lean forward with arms stiff (b) and moderate weight on hands; *three*, pull hands off with a snap (c); *four*, settle back (d) to a sitting position; and *five*, remain sitting for one count. Then begin over again. Do not hurry or interrupt the rhythm.

another relieve him at the end of a count without breaking the rhythm. Keep the patient warm, with blankets under and over him. The pressure treatment will be just as effective through the covering. If possible use hot-water bottles or hot bricks wrapped in cloth.

When natural breathing begins again, let the patient remain absolutely quiet for a time; be prepared to start the treatment again if there is a relapse. When consciousness returns give him stimulants, such as hot black coffee or aromatic spirits of ammonia.

First Aid in Poison Cases

To be prepared for poison cases you must have a few simple rules in mind. When the emergency comes, time lost in reading instructions might prove fatal. Furthermore, you cannot expect to find at hand the special antidotes recommended in books, and you dare not wait until they can be obtained.

General Rules. If a person by mistake swallows anything that burns or has a queer taste, take no chances. Give an emetic at once. An emetic is anything that brings on vomiting. One of the best first-aid emetics is lukewarm soapy water. Any soap may be used. Let the patient keep on drinking the suds until he vomits. Then, just to make sure, repeat the treatment. Sea water and warm water with a handful of salt to the quart are also good emetics. If nothing else is available, use plain lukewarm water. If the patient fails to vomit promptly, let him tickle the back wall of his throat with a finger, or do this for him.

Strong Acids or Alkalies. If a strong acid or a strong alkali has been swallowed several minutes before treatment begins, do not give an emetic. The lining of the stomach has probably been attacked and the spasm of vomiting may tear it. Instead, give neutralizing substances.

For the strong acids (hydrochloric, sulphuric, or nitric), give the patient a glass of water containing a generous tablespoonful of milk of magnesia, baking soda, powdered chalk, tooth powder, tooth paste, or plaster scraped from the wall. Next in value are milk, raw egg, flour in water, cornstarch (not corn meal) in water, and any salad oil.

For the strong alkalies (ammonia, lye, caustic soda, caustic potash), give about two tablespoonfuls of vinegar or the juice of two lemons in a glass of water, or give a glass of orange juice. If none of these is handy, give salad oil or thick cream.

Some Simple Antidotes for Common Poisons. If they can be given without delay, the following antidotes should be swallowed before the emetic:

For Iodine. A tablespoonful of starch or two tablespoonfuls of flour in a glass of water.

For Silver Nitrate. A tablespoonful of salt in a glass of water.

For Bichloride of Mercury. The raw whites of two or three eggs stirred into half a glass of water. The albumen of the egg combines with the mercury and stops its action for the time. But the resulting product is also poisonous and must be removed by an emetic in two or three minutes.

For Carbolic Acid. Three tablespoonfuls of whiskey, brandy, or gin, or a half-and-half mixture of grain alcohol and water. This will halt the burning effect of the acid, but the combination of the alcohol with the acid should be washed out at once with an emetic.

For Sleep-Producing Drugs. After emptying the patient's stomach with an emetic, give him black coffee. Keep him awake by slapping and shaking him, but do not exhaust him by too much walking.

If the patient shows signs of shock after any of these methods of treatment, follow the directions for the use of heat and stimulants given in the next section of this article. One exception, however, must be noted.

In cases of *strychnine* or *nux vomica* poisoning, do not give coffee or other stimulants. If the patient stops breathing after taking any poison, you will, of course, apply artificial respiration.

Shock and Its Treatment

Shock or collapse in the medical sense is the lowering of vitality that often follows violent injury, poisoning, or other accidents, particularly when the victim has suffered great pain or intense fear. Injuries not fatal in themselves may become so when accompanied by shock.

The symptoms are a pale face, an anxious expression, cold perspiring skin, weak but rapid pulse, and irregular breathing. Usually the patient lies with half-closed eyes and seems indifferent to his surroundings. Often he is nauseated.

Heat is by far the most important means of combating shock. Wrap the patient snugly in blankets or coats, and place hot-water bags or hot-water bottles at the feet and beside and between the legs. In the open you can build a fire and heat some large stones for this purpose; but test them on your own skin to make sure they will not burn the patient.

Do not prop the patient up or put a pillow under his head. On the contrary, place him with his head downhill, or prop up the foot of the bed.

Hot black coffee or tea and a teaspoonful of aromatic spirits of ammonia in half a glass of water are the best stimulants. If you lack these, give small quantities of hot milk or hot soup.

Sunstroke and Heat Exhaustion

If a person collapses from heat, it is of the utmost importance to examine him carefully. He may be suffering from *sunstroke* (also called "heat stroke"), or he may be a victim of *heat exhaustion* (also called "heat prostration"). The proper treatment for the one would probably be fatal for the other.

Despite its name, sunstroke may come without direct exposure to the sun. It usually begins with headache, dizziness, and dryness of the mouth. The victim may fall unconscious, or he may become delirious. His skin is dry, his face flushed and hot, and his pulse violent. The first thing is to cool him as quickly as possible. Without stopping to undress him, plunge him bodily into cold water and pour cold water over his head. Then remove his clothes. Rub his body with ice, if you can, and pack his head in ice. When a bath is impossible, the next best thing is to pour water over the patient's head; then undress him, wrap his body in a wet sheet, and keep it wet. Rub the limbs briskly toward the heart to aid circulation. Keep this up until the patient's temperature drops toward normal.

In contrast to sunstroke, heat exhaustion is marked by paleness and a clammy, perspiring skin. The body usually feels cool to the touch, though the head may be warm; the pulse is weak and breathing is feeble. The essential treatment is to keep the patient warm and to apply the other measures recommended for shock cases. Loss of salt from the body through excessive perspiration is a chief cause of heat exhaustion.

Therefore, give the patient salt in four or five half-teaspoonful doses washed down with water. He will usually swallow it eagerly with no feeling of nausea.

First Aid for Broken Bones

When a bone is broken and there is no external wound, the injury is called a *simple fracture*, even though the bone may be broken in several places. But when a broken bone has cut through the skin, or when a wound made from the outside penetrates to the broken bone, it is called a *compound fracture*.

The first rule in treating all fractures is to keep the ends of the broken bones from moving. If a doctor is expected to arrive soon, do nothing except to restrain the patient from moving because of his pain.

If it is necessary to move the victim of a simple fracture, first apply a splint or some other device for holding the broken bone firmly. Typical first-aid splints and slings for broken legs, arms, and collarbones are shown in Fig. 5. Splints should always be padded at the points where they come into firm contact with the body. You may wrap cloth around the splint, or put layers of cloth under it, or make pads from grass or leaves wrapped in cloth. Before fastening the splint draw the limb very gently into normal position. Be prepared later to loosen any bandage if marked coldness or pallor below it indicates that the circulation has been cut off.

For a broken lower jaw, carefully close it until the lower teeth fit into the upper ones. Then fasten a bandage under the jaw and around the top of the head. For broken ribs, apply wide tight bandages or adhesive strips around the body to keep the ribs from moving when the patient breathes.

If an injured man cannot move his legs, probably his back is broken; if his fingers are paralyzed, his neck is broken. If there is the slightest chance of getting a doctor, do not move the patient, except to roll him gently over on his back. If he must be moved, he should be lifted without bending his body or his neck, and placed upon a rigid support like a wide board or a door. The lifting can best be done by three or four men on each side, who thrust their hands palms up under the patient in such a way that the hands of the men on one side fit between

the hands of those on the other side. Be particularly careful to keep the head still.

A compound fracture should first be treated as a wound, and then dealt with as a simple fracture. There is great danger of deep-seated infection, which may prevent the bone from healing and make it necessary later to amputate the limb. Follow the directions for the treatment of wounds, applying an antiseptic to the bone itself if it is visible.

Disinfecting Wounds

The methods for checking heavy bleeding from wounds have already been described. The second grave

danger is infection. This threatens small wounds as well as big ones. An open wound that has bled freely is likely to be fairly clean and merely

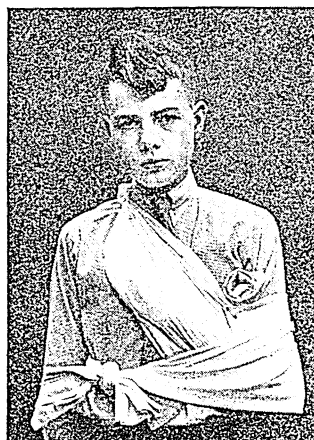
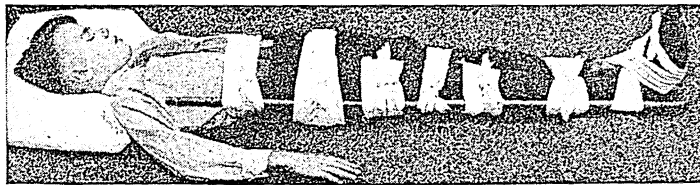
needs protection from further infection. Apply mild tincture of iodine (2 per cent) to the inside of the wound and around the edges. Do this with a swab of cotton cloth or with the glass applicator attached to the stopper of the bottle. Then fasten a sterile compress over the wound with a bandage or with adhesive tape.

Do not put iodine on the compress, for iodine applied in this way causes blisters. If you have no iodine or other antiseptic, make a pad of the cleanest cotton cloth you can find, then scorch the surface of the pad in a flame, and apply it to the wound without touching the scorched surface. Small charred bits of the cloth will do no harm.

Do not wash out a wound with soap and water. Do not apply any germicide or disinfectant to a wound unless it is recommended for that purpose by a reliable authority. Some are poisonous and some will burn flesh severely. Never put bare adhesive tape over a wound.

Puncture wounds, such as those made by a nail, are particularly dangerous because they seldom bleed enough to wash out the germs that are carried into them, and the germs of tetanus or lockjaw thrive in wounds where air cannot penetrate. Force such a wound to bleed by pressure, then work iodine as far down into it as possible by using a small tuft of absorbent cotton twisted tight around the end of a toothpick. But do not

5. SPLINTS AND SLINGS FOR BROKEN BONES



At the top, a splint for a fractured thigh made out of a long stick. Still better would be a board as wide as the leg. Notice that some of the bandages pass around both legs. Middle picture, a broken upper arm splinted and supported in a sling. Below, rig for a broken collarbone.

let the cotton remain in the wound.

If a wound becomes seriously inflamed before it is possible to consult a doctor, boil some water, add three tablespoonfuls of salt to the quart, soak a large compress in the solution and apply it to the wound as hot as can be borne. Keep it in place for an hour, reheating the compress every few minutes by dipping it into the solution again. Repeat this treatment every six hours.

Carrying an Injured Person

A blanket makes the simplest substitute for a stretcher. Place the patient in the middle of it and roll the long edges up close to his body. Two persons on each side, grasping the rolled edges, can lift him without danger of a slip. It is still better to roll the blanket edges tightly around two long poles. If you have no blanket, push the poles through the sleeves of two or three coats in a row, and then button the coats inside out around the poles.

One of the best two-man carries, if no stretcher of any kind can be devised, is shown in Fig. 6. And perhaps the best one-man carry for long distances, when the nature of the injury permits, is the "fireman's lift," also shown in Fig. 6. Another is the "pack strap carry," in which the patient's arms pass from behind over the carrier's shoulders and are crossed over his chest, where they are held firmly or tied together. As the carrier leans forward, the patient's feet are lifted from the ground and his weight is evenly distributed over the carrier's back.

Other First-Aid Hints

Bite by Cat or Dog. Treat as a puncture wound. If rabies is suspected, call a doctor and hold animal for observation.

Blisters. Put a little mild tincture of iodine on the edge of the blister. Sterilize a fine needle by heating it in a flame. Open blister on the iodine-treated edge. Gently press on outer edges to remove water or blood. Cover with a sterile dressing. If the blister is large, see a doctor.

Bruises. To lessen swelling and to help prevent discoloration, apply ice or cold wet cloths at once.

Burns and Scalds. Injuries from dry heat are called burns; from moist heat, such as steam or hot water, scalds. In first-degree burns the skin is reddened; in second-degree, skin is blistered; in third-degree, the tissue is charred or badly injured. For a small first-degree burn, apply any good burn ointment. Do not use oils or ointments, however, on a large first-degree burn. Gently cover burns of this sort, as well as second- and third-degree burns, with a compress soaked in warm water containing three tablespoonfuls of baking soda to the quart. Keep the compress wet with the solution until the doctor comes. Never put iodine on a burn or scald, and never pull away bits of clothing that stick to a burn.

Choking. Strike the patient between the shoulders with a quick, smart slap. Hold a choking child upside down as

6. CARRYING METHODS



Above, the carriers lock left hands under the patient's hips, leaving right hands free to support head and legs. Below, for the "fireman's lift" the carrier's right hand passes between the patient's legs and grasps the patient's right hand. This leaves one of the carrier's hands free.

you slap. In severe cases call a doctor. If the patient cannot breathe, give artificial respiration.

Colds. Rest in bed and drink a quantity of fluids. A teaspoonful of baking soda in water every two hours, taken three times, helps many people. Avoid drafts and do not get your feet wet.

Earache. An ice bag or hot-water bag frequently eases the pain. If the ache persists, however, see a doctor.

Fainting. Lay the person on his back; lower the head below heart level or elevate the legs to help the blood to return to the brain. Loosen his clothing, sprinkle cold water on his face, and give him smelling salts or an ammonia inhalant. If he does not recover quickly, warm him with hot-water bags and call a doctor. You can usually prevent a person from fainting by having him bend over until his head is on a level with his knees.

Foreign Body in Ear. To kill an insect, put a drop or two of olive or mineral oil in the ear. Always, however, have a doctor remove the insect or any other object.

Foreign Body in Eye. Never rub. Gently pull the upper lid out and down over the lower, and hold there for a few seconds till the tears can wash the object to the corner of the eye. Never try to remove an object imbedded in the eyeball or eyelid. Put a drop of olive or mineral oil in the eye, cover with a sterile compress, and call a doctor.

Foreign Body in Stomach. Never give a laxative to a person who has swallowed a button, pin, coin, or other hard object. Call a doctor immediately.

Frost Bite. Do not rub with snow. Warm the frozen part with your hand or additional clothing, or thaw it gradually in cold water. Take plenty of time. Do not enter a hot room or get near a fire.

Insect Bites, Stings. Do not scratch. Put on a paste of baking soda, or a compress dipped in ammonia water.

Ivy, Oak, Sumac Poisoning. Gently wash (preferably before rash develops) with soap and warm water, then with rubbing alcohol. Paste of mild soap may be applied for 8 hours. Doctor may give injections for prevention and treatment.

Nosebleed. Have patient sit upright, head slightly back, and tell him to breathe through his mouth. Put cold wet compresses on nose, and press nostrils together for five minutes to allow a clot to form. If bleeding continues for more than an hour, call a doctor.

Pain in Abdomen. Do not give laxatives, especially if nausea or vomiting accompanies pain. Laxatives may rupture the appendix! Put the patient to bed. If pain or other symptoms persist, call a doctor.

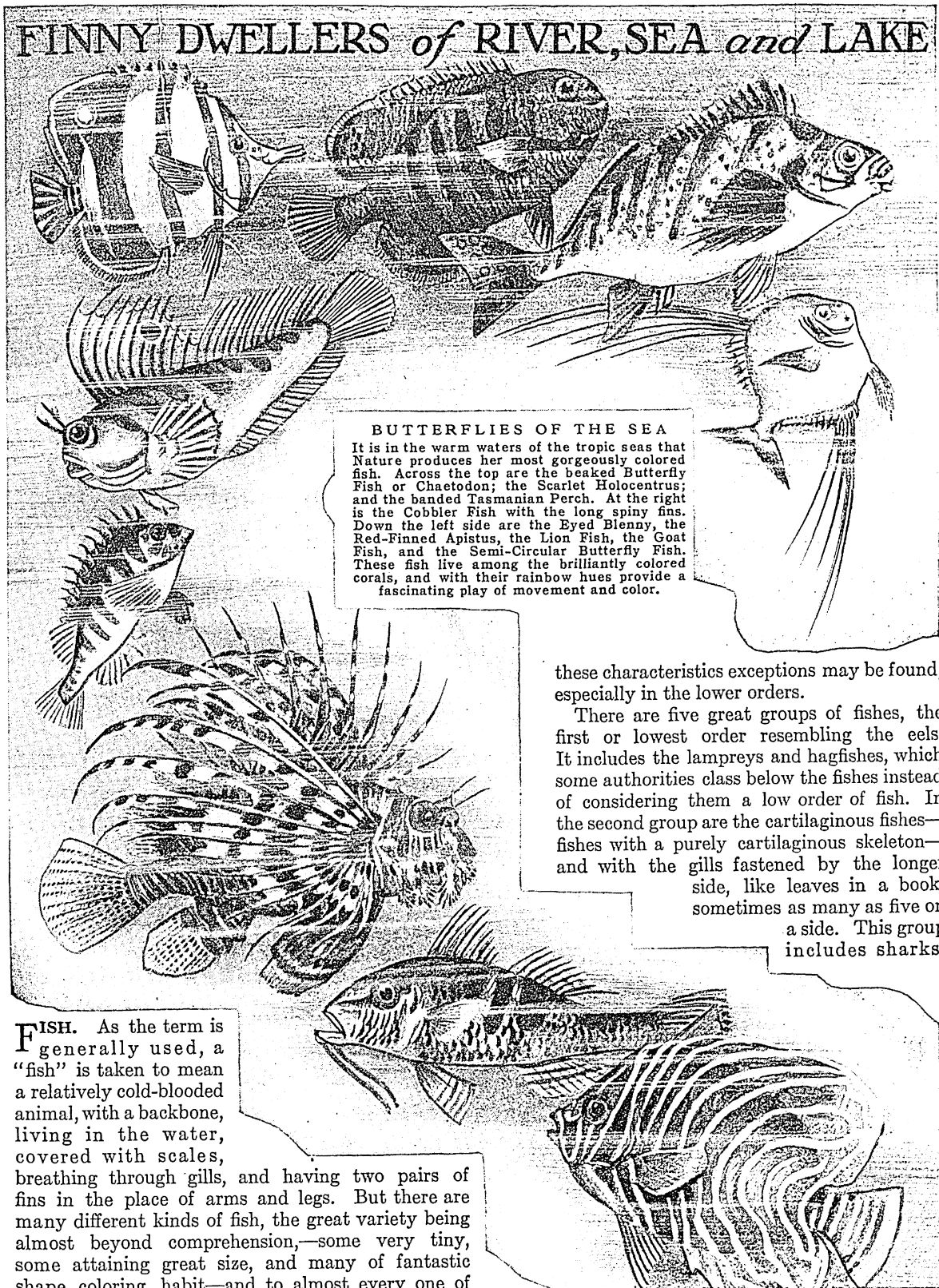
Splinters. Touch the skin with mild tincture of iodine. Always sterilize your needle, tweezers, or knife point in a flame. After removing splinter, gently press the wound to make it bleed, then touch with iodine, and put on a compress. If the splinter is imbedded deeply, see a doctor.

Sprains. Keep a sprained joint raised in a sling or elevated by pillows or other material. Apply ice bags or cold wet compresses until the doctor comes. If you must walk on a sprained ankle, leave your shoe on.

Sunburn. Treat as first- or second-degree burn (see paragraph on Burns and Scalds).

For further information on all branches of first-aid work, consult the American Red Cross First Aid Textbook. (See also Safety Education; Camping.)

FINNY DWELLERS of RIVER, SEA and LAKE



BUTTERFLIES OF THE SEA

It is in the warm waters of the tropic seas that Nature produces her most gorgeously colored fish. Across the top are the beaked Butterfly Fish or Chaetodon; the Scarlet Holocentrus; and the banded Tasmanian Perch. At the right is the Cobbler Fish with the long spiny fins. Down the left side are the Eyed Blenny, the Red-Finned Apistus, the Lion Fish, the Goat Fish, and the Semi-Circular Butterfly Fish. These fish live among the brilliantly colored corals, and with their rainbow hues provide a fascinating play of movement and color.

these characteristics exceptions may be found, especially in the lower orders.

There are five great groups of fishes, the first or lowest order resembling the eels. It includes the lampreys and hagfishes, which some authorities class below the fishes instead of considering them a low order of fish. In the second group are the cartilaginous fishes—fishes with a purely cartilaginous skeleton—and with the gills fastened by the longer side, like leaves in a book, sometimes as many as five on a side. This group includes sharks,

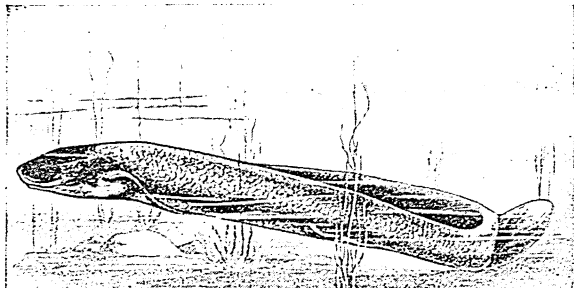
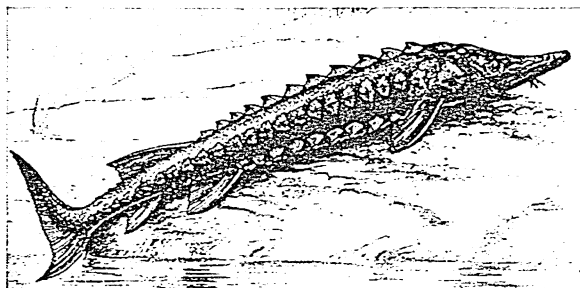
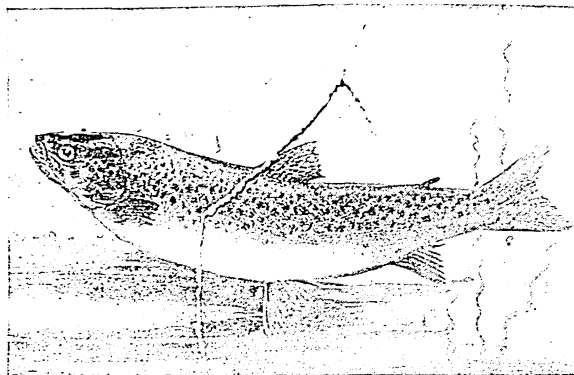
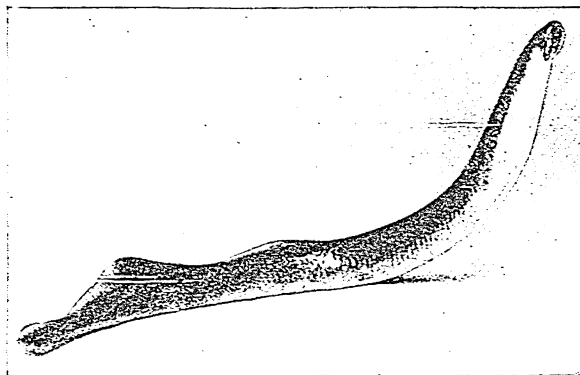
FISH. As the term is generally used, a "fish" is taken to mean a relatively cold-blooded animal, with a backbone, living in the water, covered with scales, breathing through gills, and having two pairs of fins in the place of arms and legs. But there are many different kinds of fish, the great variety being almost beyond comprehension,—some very tiny, some attaining great size, and many of fantastic shape, coloring, habit—and to almost every one of

rays, and skates. The outstanding characteristics of this group are the skeleton, consisting of gristle without bone, and the peculiar skin. They have no true overlapping scales; the skin is tough and mottled, and is naked, or covered either with wart-like pro-

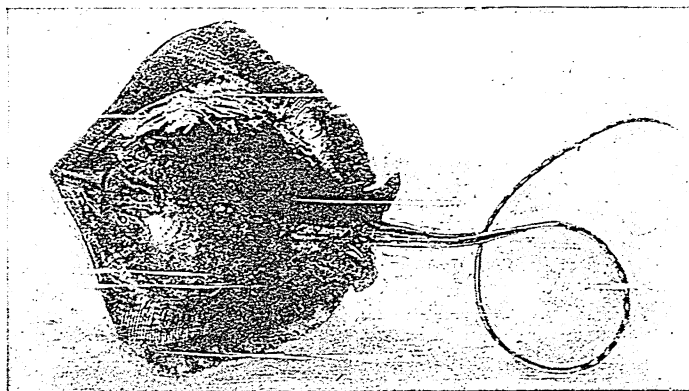
pike, mackerel, etc. Of this latter group, those possessing spiny-rayed fins are considered the highest.

The body of a fish is shaped like a boat—or perhaps it would be better to say that man, seeing how easily the fish cleaves the water, patterned his boat

HIGH AND LOW IN FISH SOCIETY



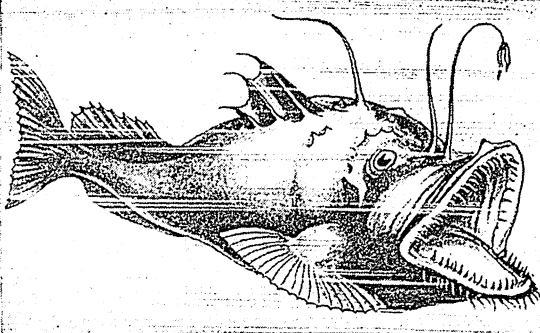
jections, as in shark skin (*shagreen*), or further protected with spines and prickles. The third group consists of the double-breathers, possessing both gills and lungs, which enable them to live in the air under certain conditions. They have peculiar fins, more like legs than those of other fishes. The fourth group is composed of the armored fishes or *ganoids*, covered with enamel-like scales or rows of bony plates, as in the case of the sturgeon. Under this group are the gar-pike, the paddlefish, the sturgeon, the bowfin, and the alligator-gar. Fossil fishes of this group are found in very ancient rocks. The fifth group, the modern or bony fishes, includes most of the food and game fishes in fresh and salt water—the cod, bass, perch, trout,



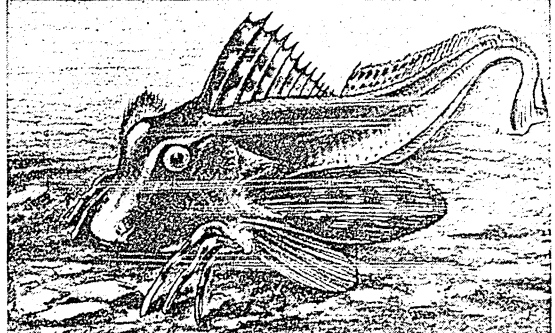
The Lamprey in the upper left-hand corner is perhaps the lowest member of the society of fish. The trouble is he hasn't any real backbone. It's just cartilage, and some scientists refuse to consider him a true fish at all. On the other hand the Trout, to the right, belongs to the very highest group, the "Bony Fishes." That sharp-nosed Sturgeon, next at the left, is a member of the very ancient Ganoid stock, which was prominent in the Paleozoic Age, but has now fallen to a low estate. The Lung-Fish, next to him, is a sort of outcast, for he breathes with lungs and can live a long time out of water, things no proper fish would think of doing. The Sting Ray, at the bottom, is a villain who not only breaks the rules of good fish form, but carries a poisoned dart on his tail.

from the shape of the fish. The head is fastened without a neck, and the greatest width of the fish's body is in front of the middle. A flattened tail is used to propel the fish through the water, the fins directing the course. Most fish depend on speed to secure their food or to escape from their enemies, so their bodies are shaped for speed; but there are some fish that hide on the bottom of the sea, or in crevices, and others, as mentioned above, that are protected by bony plates. Some of these fish are almost globular in shape. The body is generally covered with overlapping scales, growing attached to the skin. Some are covered with smooth skin, as the cat-fishes, and the *ganoids*, as stated above, are armored.

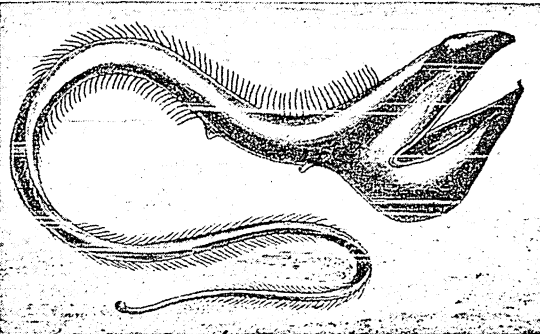
A FEW OF NATURE'S FISHY FREAKS



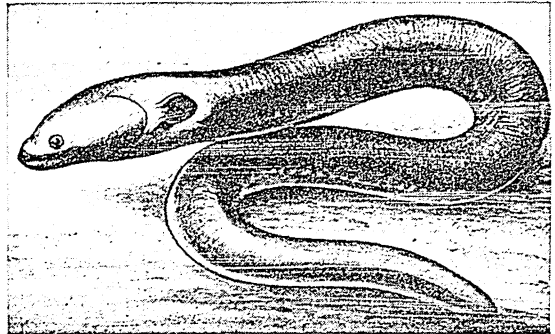
The Goosefish, or Angler Fish, lies on the ocean bottom with his mouth open. His waving feelers attract small fish, and, when one comes close enough, the great jaws fly shut and the Angler dines.



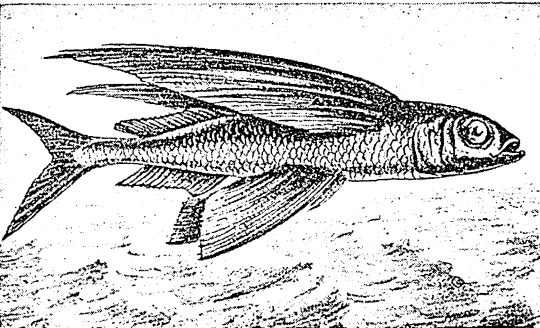
The curious Streaked Gurnard has a huge armored head and organs like fingers with which he walks on the sea bottom. His side fins are also unusually large. His family consists of many varieties throughout the ocean.



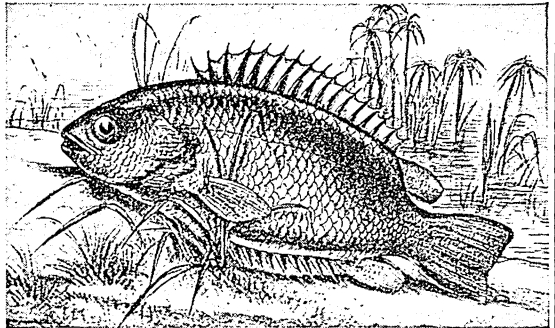
This deep-sea monster, who seems all mouth, belongs to the "Pelican Fish" family and lives in the black and icy depths, where the sun's rays never penetrate.



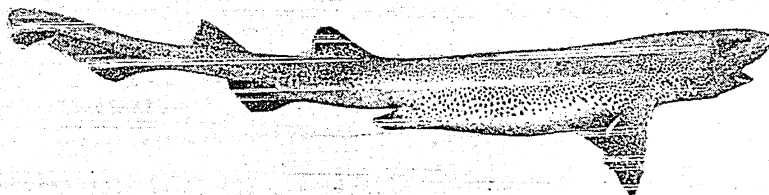
The Electric Eel is Nature's greatest storage battery. His "charge" is strong enough to shock a horse, and comes from electric cells along his tail.



The Flying Fish is one of Nature's puzzles. Scientists cannot agree whether he really flies by flapping his fins, or merely soars through the air. Whichever may be the truth, some varieties of flying fish can cover 200 yards or more in the air, and even alight on the decks of ships in efforts to escape their enemies.



The Climbing Perch of India saunters about on land in search of new water when his old home threatens to dry up, and sometimes even climbs trees. He does this usually during the night or early morning when dew is on the ground. He has a special arrangement for keeping his gills wet during his land travels.



The Spotted Dog-Fish is a small shark, and he hunts in packs with his comrades through shallow waters near shore. His long body with his powerful fins makes him a highly efficient hunter, and fishermen dislike him because he scares away the food fishes.

The movement of the tail and fins is controlled by muscles and it is this part that we eat. The backbone is loosely jointed, so that the fish may turn, twist, and dart at ease. Most fishes possess an air-bladder, but its purpose is not clear; it has been regarded as a balance, weighting or lightening the body as required. In the lung-fishes the air bladder is divided to form the lungs.

How a Fish Gets His Breath

A heart pumps the red blood through the body, just as it does in the higher animals. The blood is purified in the gills by the oxygen in the water. Sometimes when the water is foul, the fishes come to the top and try to gulp in the air, but their gills are not fitted to use the oxygen in the air. Fishes breathe the water by taking it in at the mouth, letting it flow over the gills and out through the opening behind the gill covers.

Along the sides of fishes there is a line called the lateral line which is made up of peculiar scales, beneath which there are a great number of nerves. This is probably a sense organ helping the fish to perceive disturbances in the water.

A fish has a face something like that of the higher animals. There are eyes, a nose, and a mouth. The eyes of fishes vary greatly in size and form. There are no eyelids and the fish can see but a little distance. In the Mammoth Cave in Kentucky, and in other caves, the fishes are blind; once they had eyes, but through long disuse these are now lost entirely; only a small fold in the skin remains. The power of smell is located in the nostril, but it is very feeble. This nostril is a closed sac and has nothing to do with breathing. The sense of taste varies greatly. The tongue is hard, gristly, and immovable, and the fish eats very fast, chewing merely to cut or crush the food, often swallowing it whole. Fish hear scarcely at all, and the hearing apparatus is buried in the skull and has nothing to do with the ear-like flaps. They are, however, very sensitive to disturbances in the water, as the sense of touch is very highly developed. If they come in contact with a moving object fish dart quickly away. Some fish have sensitive feelers or "barbels" by which they explore the bottom or feel their way to food, and these barbels are highly specialized. They are attached sometimes to the nostrils, sometimes to the jaw-bone, sometimes to the skin of the chin or snout, and vary greatly in length. The goat-fishes of the tropics are named for the two long barbels that hang from their chin.

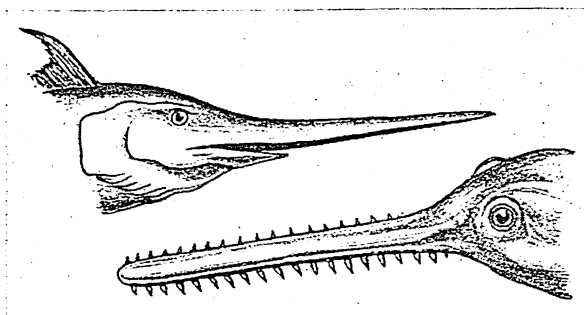
The nervous system of the fish is not highly devel-

oped, and it feels very little pain. It often happens that a fish which has torn itself loose from the hook will be caught again soon after, still bleeding from the first wound.

The mouths of the various genera and species differ widely. Sometimes the mouth is a great horizontal gash almost from gill to gill, sometimes it is round and tiny, and sometimes it is developed into a long snipelike beak. The jaws also differ widely. Sometimes the bones are joined with ligaments that may be stretched, especially among deep-sea fishes,

so that the fish may swallow other fish larger than itself. Sometimes the jaws are tubelike, and it is a wonder that the fish can swallow anything. The mouth may have no teeth, or the teeth may be on the jaw-bone only, or on any bone in the mouth's circumference. Just inside the mouth are gill rakers which strain the water, and at the opening of the gullet behind the gills are bones armed with additional short thick teeth.

TWO TERRORS OF THE DEEP



The Swordfish is a murderous creature, who fights without reason. He will attack anything from a whale to a small boat, and has even been known to pierce the sides of large ships with his sharp nose, which grows as long as three feet. The Sawfish, however, is more cruel than bold. He takes delight in chopping up such soft-bodied animals as the octopus and the cuttlefish with his jagged six-foot snout.

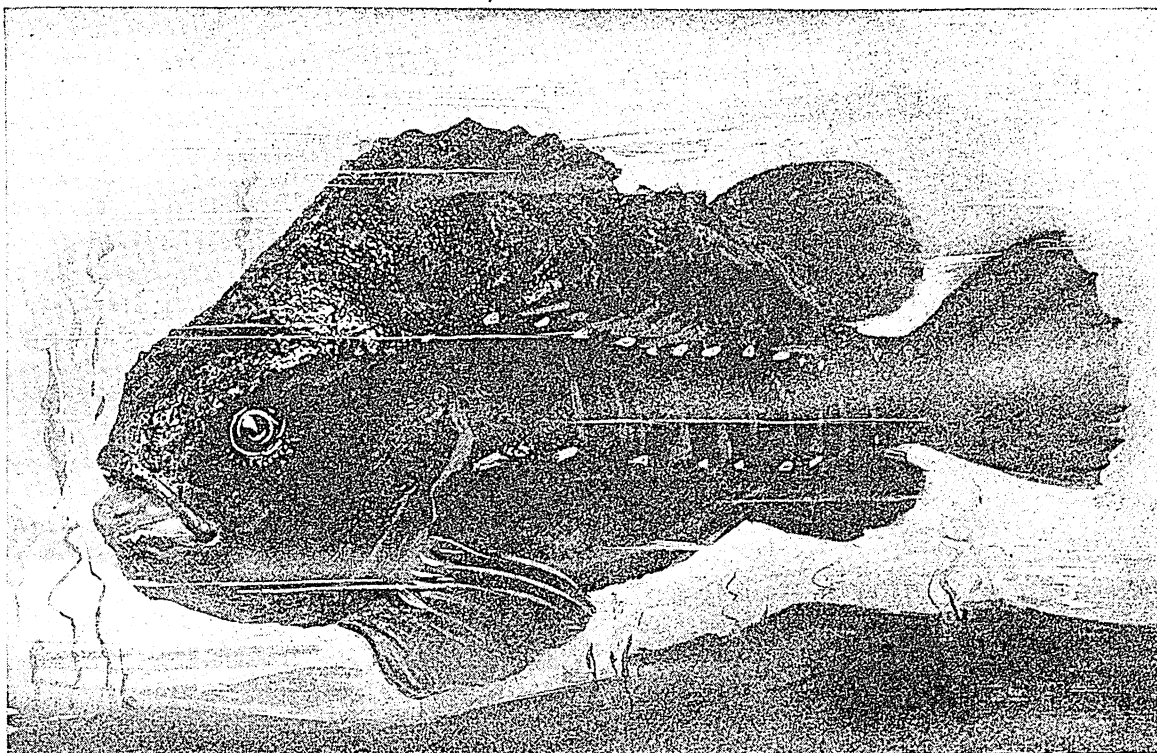
There are almost as many colors of fish as there are shapes. The ground color is usually protective, with mottled or barred colorings. In the majority of cases the ground color of the back is gray or a sort of olive, with the belly white. To birds looking down on the water the back with its mottled stripes is the color of the water with the shadows on it; to fishes below in search of prey the belly is the color of the surface of the water, with the atmosphere above it. In the tropics where red seaweeds and other aquatic growths of brilliant colorings abound, the fish are bright colored. In the greater depths of the ocean, the fish are deep black or violet black, sometimes with silvery phosphorescent lights.

"Camouflage" in the World of Fish

A writer in the Bureau of Fisheries has the following to say regarding the color changes of fish:

"Camouflage is a new word to the English language and a new art developed under the stress of necessity, but it is old in nature, especially among many of the lower animals. Hiding-colors to resemble a background or the general color tone are exhibited by most fishes and in many cases the likeness is very close, as may be observed by a visit to any aquarium, especially in regard to the flounder. In these fishes the skin changes to resemble the varying patterns not only in color but even in the pattern in which the color is arranged and it is often difficult to see them as they lie exposed in the tanks. These changes result automatically from impressions received through the eye and if the head lies over a back-

HE'S NOT HANDSOME, BUT HE'S A FAITHFUL FATHER



Unlike most fish, who abandon their eggs and young to fate, this exceedingly plain male Lumpsucker stands guard over the eggs, and defends them with great courage against prowling enemies. He gets the last half of his name from the "sucker disc" he carries between his lower fins, which he uses in attaching himself to various objects.

ground of one color and the rest of the fish over another, the entire body adapts itself to the color and the pattern nearest the eyes.

"But there are color changes which apparently have little or no relation to camouflage. We are all familiar with the changes of the human face under stress of emotions, the flush of anger, the blush of shame or embarrassment, and the pallor of fear; but it is not generally known that in fishes there is a much more vivid and extraordinary play of color correlated with varying moods and emotions. There are color patterns characteristic of fear or alarm, of anger or belligerency, of rest and play, and in some fishes these phases differ from one another so markedly that the uninitiated would be warranted in believing them to characterize distinct species and not mere 'states of mind' of the individual."

Little interest is displayed by most fishes in their young. After the eggs, a jelly-like mass, are deposited, they are left to hatch or be destroyed as chance wills. There are exceptions to this practice. The stickleback builds carefully a nest of sticks cemented with an excretion from his body, and after the eggs are deposited stands guard until the fish are hatched. Bass and sunfish also guard their eggs. The male frog-fish is said to pick up the eggs deposited by the female, and blow them from his mouth along with bubbles of mucus, which hardens about the

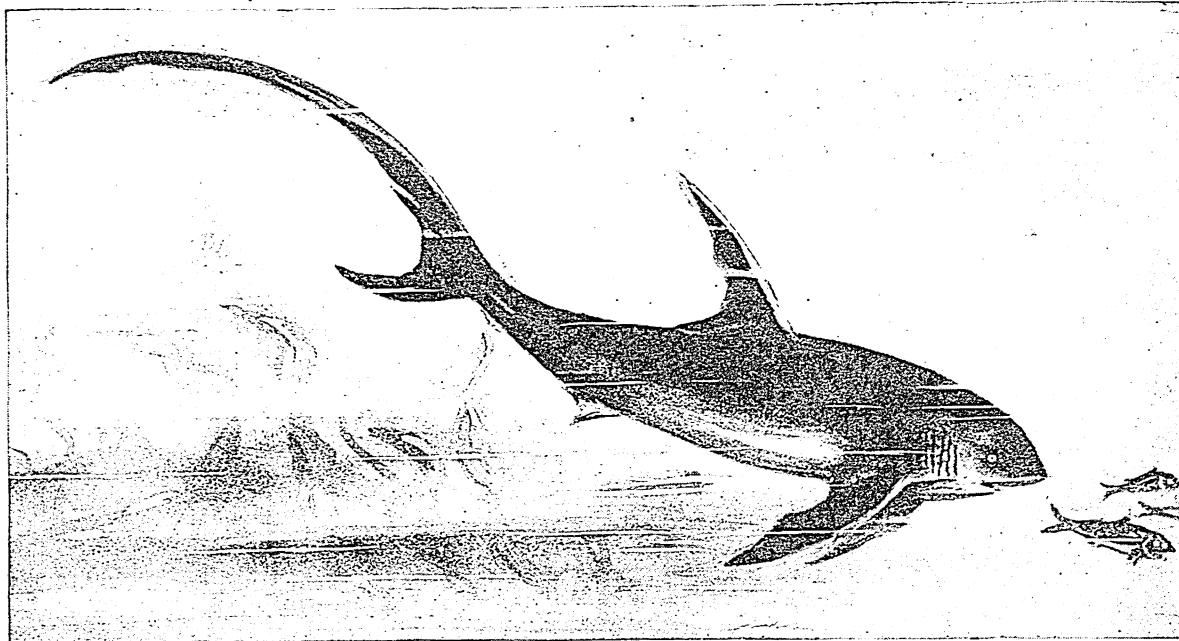
mass of eggs and forms a light floating bag. Some species of fish, among them the salmon and shad, leave the sea and ascend to the headwaters of rivers to deposit their eggs; others, such as the common eel, living in fresh water, go to the sea to spawn. Some fish hatch their young in an egg-sac attached to the body. Some of these baby fish are tiny at birth, some quite large. Some sharks and a few other fishes are born alive. Most young fish take care of themselves from the first. The destruction of eggs and young is very great, for almost every species is a prey of larger fish, so the vast numbers of eggs that are deposited by some fishes are necessary to preserve the existence of the species. For example, a large cod produces about 10,000,000 eggs every year.

Violent Death the Rule in the Fish World

In general the young fish differ from the adult only in size and proportion. The eyes and head are comparatively larger, the fins are lower, and the body comparatively more slender. Most fish live on indefinitely, or until they fall victims to larger species. The exceptions to this rule are those fishes, such as the salmon, which have a definite period of growth before spawning, and after spawning die.

Some fish are killed more readily than others. Fish usually die very quickly in the air or in foul water. Wisconsin farmers, however, after high water has covered their land, often plow up still living

HE ROUNDS UP VICTIMS WITH HIS TAIL



The Fox or Thresher Shark beats the water in the vicinity of herring or mackerel schools with his tail. This frightens the smaller fish and they flock together. When the mass is dense enough to suit the shark, he rushes in with his mouth wide open, and scoops in a satisfying meal.

mud-minnows buried in the mud. The Alaska black-fish, a similar fish, has been fed frozen to dogs and has been recovered alive after being thawed out by the heat of the dogs' stomachs. A cat-fish may still be alive hours after it has been thrown on the bank. The African lung-fish lives in a ball of half-dried mud during the dry season, and some of the Asiatic lung-fishes can maintain themselves for a long time out of water. Carp frozen in the ice are said to revive in the spring.

Some fish eat both vegetable and animal matter, others eat only vegetable matter, and still others confine their diet to other fish. In flesh-eating fish the mouth is large. Some fishes live on minute organisms strained from the water.

Altogether there are about 20,000 species of fish, all interesting, and many with remarkable characteristics and fantastic shapes and colorings. The tunny (also called tuna fish), a giant mackerel, grows over 10 feet long and weighs 1,000 pounds or more. The man-eating shark, found occasionally in all warm seas, reaches a length of 30 feet and weighs perhaps a ton or more; it is swift, enormously strong, and the most voracious of fish-like animals. The whale shark is the largest living fish, and attains in rare cases a length of 65 feet. The oar-fish, on the other hand, although it attains a great size, 600 pounds or more, is stupid and defenseless and has a body half-transparent. Some writers think that this is the famous "sea serpent with a horse's head and a red mane" that at times has caused so much excitement on the southern seacoasts of the country.

It is a deep-sea fish, light bluish in color, with a slender and sinuous form, compressed like a ribbon, and with its dorsal fin tipped with red. The head has a long jaw and a high forehead, somewhat resembling a horse. When driven from the depths of the sea, its body swells and bursts because of the decreased pressure of the water, and it is thus sometimes washed ashore.

As to the Voices of Fish

Fish usually have no voices, but there are fishes which do make a distinct noise. Sometimes this is a grating sound caused probably by the rubbing together of the short thick teeth of the gullet; and sometimes it is a quivering or singing sound, probably arising in the air-bladder. The singing fish of the California coasts is an example of the latter.

Some fishes have curious weapons of offense and defense. There are the electric fishes, with power to inflict electric shocks on their prey or their enemies. The electric eel, which is not an eel but more like the carp, inhabits the rivers of Brazil and the other countries of South America and its shock is powerful enough to stun a man. Some fishes are provided with a poisonous slime or mucus which flows over the spines, so that a wound made by them is very painful. The spines of the common cat-fish have this property to some extent. In some fishes the form of this spine is modified so as to form a poisoning instrument, and the poison is pressed through the tube as the spine is thrust in. The greater weever of the African coast has poisonous spines on its gill covers.

The frog-fish of the tropical seas have two fins



Painting by Milo Winter

See text on following page

SOME ODD INHABITANTS OF THE SEA

The fish world holds marvels of life and color more astonishing perhaps than any to be found on land. Here the artist shows you a corner of this strange world. Read more about it on the next page.

SOME ODD INHABITANTS OF THE SEA



KEY TO PRECEDING COLOR PLATE

You see a flat Angel Fish (1) looking on like a submarine moon while a school of Blennies (3) swims into view. Between them a pair of Sea-Horses (2), gripping the kelp with their tails, are hoping their hungry foes will mistake them for bits of seaweed.

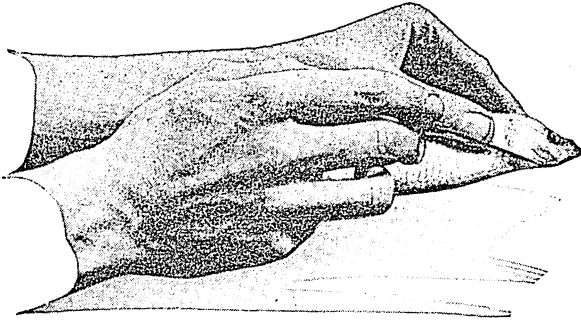
That red Sea Fan (4) seems to be a plant, but it is really a colony of tiny coral animals. Below it, the hideous Gurnard (5) is searching with its six feelers for food on the ocean floor. Those star-shaped "flowers" at the right (6) are animals too—Sea Anemones. Let some passing creature brush against those "petals" and they will close up like a flash, and if the passing creature happens to be small enough, it will be caught inside and eaten. At the left you observe a Sea Urchin (7) protected as it crawls mouth down along the bottom by its sharp spines. And in the corner, to complete the picture, lies a Mushroom Coral (8), stone-hard and beautifully fashioned.

THE ocean waves, so monotonous in their restless, eternal dance, hide beauties more vivid and shapes more strange than any dry-land vista can show. There are gardens colored like sunsets, lawns and parks of brilliant hues, and forests of tangled green and brown. There are mountain peaks and dark caves and valleys so deep that not a ray of sunlight ever reaches them.

On the preceding page is a scene such as you might observe if you were lying very quiet on a bank of sea moss off one of the West Indies islands peering through the glass window of a diver's helmet.

resembling legs, with which they creep along the rocks like toads. The head is the largest part of the body and the mouth the largest part of the head.

HOW THE "FISH DOCTOR" WORKS



Although the fish doesn't consult the doctor, in fish culture stations the doctors treat him anyway whenever necessary. Here we see a "fish doctor" removing a fungus growth from the fish's gills.

The jaw muscles are strong and the teeth sharp. This fish belongs to the anglers—fish with filaments sprouting from the top of their heads, presumably to attract other fish within reach. Some of these barbels are bright colored, some glow with a phosphorescent light.

In the swordfish and sawfish the snout is prolonged into a long flat blade. The sawfish has strong "teeth" along the sides of its "saw," and a small mouth with pavement teeth suitable for crushing its food.

In East India there is the climbing perch. When there has been a heavy rainfall and the water runs profusely down the trunks of the trees at the edge of a pool, these perch crawl up the trees sometimes to a height of five to seven feet, by using their fins. If the fish is thrown on the ground it runs along in the same manner, as long as the skin remains moist. The flying-fish are capable of lifting themselves from the water and soaring through the air, sometimes for a quarter of a mile, the large pectoral fins spreading as a parachute to sustain the body.

The fishes of the tropics are often brilliantly colored. The parrot fishes of the Mediterranean and many tropical seas have vivid colorings of red, green, and purple; and the butterfly-fishes are striking examples of black and yellow coloration. The goldfish of China and Japan are found only in domesticated specimens, the brilliant coloring being retained by artificial selection. The original goldfish was olive colored, as is shown by descendants of specimens which have escaped into the Potomac River.

The value of fish to men is not confined to its use as a food. Some fish, especially the menhaden, are sought for the oil which they yield, while the skin of some others is valuable. From dried and powdered fish offal valuable fertilizers are manufactured.

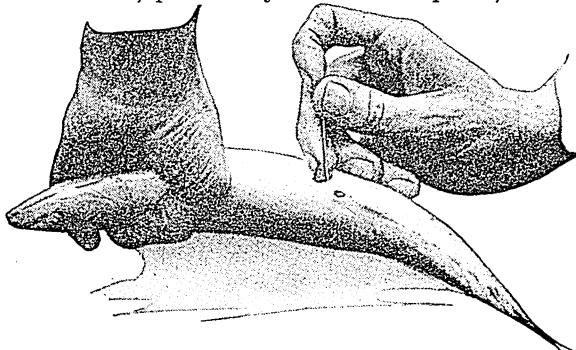
How Fish Came to be Fish

Fish are particularly interesting from the point of view of the theory of evolution because they are regarded as the first vertebrate (backboned) creatures produced by nature. Scientists tell us that at a very remote period certain animals began to develop a spinal cord. At first this was little more than a bundle of nerve fibers down their backs. But in the course of time this cord in some of the water dwellers became covered with a jointed rubbery sheath of cartilage to protect it, and riblike arches grew out from this sheath. At the same time the skins of these creatures developed horny dots. These were the ancestors of the fish. Sharks and rays are survivors of this primitive type.

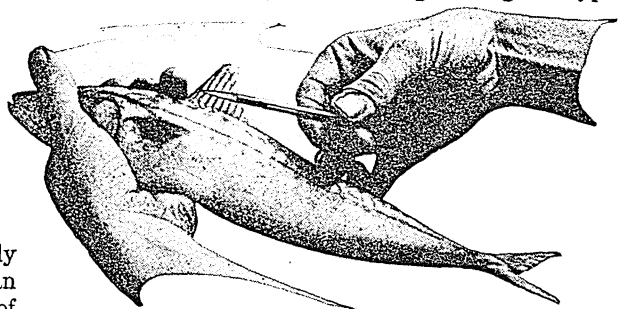
In another group the bony dots developed into armor-like plates, and this "ganoid" type also survives in fishes like the sturgeon. These two families ruled the sea as late as the Coal Age.

Meanwhile another branch developed air-breathing apparatus, and crawled out occasionally upon land, as in the case of the present-day climbing perch. From such creatures developed amphibians, reptiles, and birds. (See Birds; Evolution; Reptiles.)

Under water the course of evolution developed the cartilage skeleton into bone and changed the bone-like dots into scales, thus creating the highest type



Here the doctor is puncturing the air-bladder, because some internal disorder has caused it to be unduly inflated.



This picture shows how the "fish doctor" removes portions of a fin. In all these operations the fish feels little or no pain, and would probably feed placidly if given the chance, while the doctor is cutting.

of fish, such as the bass. The development continued until the period which geologists call the Pliocene, since which time the fish family has undergone practically no change.

PRINCIPAL FOOD FISHES OF THE WORLD

| Name | Description | Habits | Remarks |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bass(Fresh-water) | A game fish, with rather elongate, moderately compressed body, greenish with darker markings. | Large-mouthed bass lives mostly in lakes and sluggish streams; small-mouthed lives mostly in streams and cold lakes. | Considering its size, the gamest fish that swims. Protected by law in many states. |
| Bass, Striped (Salt-water) | Greenish-brown, sides golden silvery with narrow black stripes. Weighs up to 100 lbs. or more. | Lives in shallow waters in sea, ascends rivers to spawn, prepares nests and takes great care of young. | Important commercially and affords excellent sport to angler. "A gallant fish and bold biter." Introduced from the Atlantic into the Pacific. |
| Bluefish | A salt-water fish, weighs up to 25 lbs.; usually under 5. Bluish or greenish above and silvery below. | One of the most destructive of fishes, killing more than it can eat. Found in Atlantic and other seas. | As a food fish has few superiors. Taken by nets and line hooks. |
| Carp | Fresh-water fish with greenish gray compressed body; weighs up to 40 lbs. or more. | Dull and sluggish, living near bottom of muddy pools and streams. Can be domesticated. | Not valued highly as food but flesh remains firm long after shipping. |
| Cat-fish | Smooth-skinned, slimy fish, with spines on fins and "whiskers" around mouth. | Many species the world over, mostly fresh-water, many in salt water. Abounds in brooks, lakes, and ponds. | All species are good food fishes. Pectoral fin can make an ugly wound. |
| Cod | Sea-fish with long barbel under chin. Back and sides greenish with brown spots. Averages 12 to 35 lbs.; maximum, 212 lbs. | Omnivorous; abounds on northern coasts of Europe, and Atlantic and Pacific coasts of United States and Canada. | One of the world's most important food fishes. Cod fisheries are an important industry in many countries. |
| Haddock | Resembles cod, with smaller mouth, dark spot behind head. Black lateral line. Average size, 3 to 4 lbs.; largest, 17 lbs. | Found on cod-fishing grounds in large schools; feeds on bottom of the sea. | A valuable food fish; will keep on ice longer than most varieties. "Finnan haddie" (Finland haddock) is smoked haddock. |
| Halibut | Member of the flatfish group, with both eyes on same side. Dark above and whitish below. Average weight, 50 to 75 lbs. | Has about same geographical range as cod, showing a preference for cold water. Feeds on crabs, mollusks, and other fish. | Most important of flatfishes as a food supply. Food value greater than cod and less than mackerel. |
| Herring | Well formed sea-fish, thin scales, blue-green above, silvery-white below. Average length, 12 in. | Great schools come into shallow water to spawn. Principal food small crustaceans. | Most important food fish in world; not used so extensively in America as in Europe. |
| Mackerel | A perfectly proportioned sea-fish, varying in length from 10 to 18 in., in weight from $\frac{1}{2}$ to 3 lbs. Bluish or green with wavy black stripes on top, silvery beneath. | Travel near the surface of the sea in great schools, sometimes so large as to cover 10 square miles. They feed on small ocean fish. | Spanish mackerel of the S. Atlantic important but not so abundant as common mackerel. Tuna fish or tunny, a giant mackerel, found in all warm seas; up to 10 ft. long and over 1000 lbs. weight. |
| Muskellunge, or Maskinonge | Magnificent fresh-water game fish, largest member of pike family, sometimes reaching a length of over 6 ft., and a weight of 100 lbs. General form that of a pike, dark gray above with blackish stripes on sides on background of silvery gray. | Native to all the Great Lakes, and other lakes and streams of northern United States and Canada; comes from deep waters to river to spawn. | Considered one of best food fish, equalling black and striped bass. Usual method of capture is trolling. |
| Perch | Family of about 125 fresh-water species. Elongated bodies. Colors vary from yellow to blue. | Abound in streams and lakes of Northern Hemisphere. | All varieties rank high as food. Flesh very sweet and appetizing. |
| Pike and Pickerel | Soft-rayed, smooth-scaled fresh-water fish, bluish or grayish with yellowish-white spots, slender and long snouted. | Noted for remarkable appetites and fighting qualities; terror to smaller fish that share their waters. Found in rivers and fresh-water lakes of North Europe and North America. | Attractive to sportsmen because of its gameness and fighting strength. Pickerel means literally a "little pike." |

FOOD FISHES OF THE WORLD—*Continued*

| Name | Description | Habits | Remarks |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pompano | Seafish about 1½ ft. long, slightly flattened, bluish above and silvery or slightly golden below. Average weight, 2 to 4 lbs. | Inhabits chiefly the South Atlantic and Gulf coasts of U. S.; occasionally found on Pacific coast. | One of finest of food fishes, cooked only by broiling. Taken in nets. Few fishes bring higher prices in the market. |
| Redfish | Game sea-fish, gray with coppery iridescence; sometimes grows to length of 5 ft. | Found in the coast waters of United States from Massachusetts to Texas. | Important food fish but not highly esteemed; abundant on Texas coast. |
| Salmon | Large fish living in salt and fresh water; nearly a dozen species on Atlantic and Pacific coasts. Brownish above with silvery sides, black dotted; flesh red-dish orange. | Ranges northward of Spain in Europe and of New York in North America. The species that live in salt water enter fresh water streams to spawn. | Most important of American food fishes. Chinook, silver, and sockeye the three most important species on the Pacific coast. |
| Shad | About 30 inches when full-grown, bluish with silver sides. Usually a dark splotch behind gill covers. | Ranges along Atlantic coast from lower Canada to Florida. Introduced into Pacific from 1871 to 1886; now abundant there. | Delicate food fish, in spite of many bones. First fish to be protected and artificially propagated by the United States Fish Commission. |
| Smelt | Small fish related to the salmon, about 12 in. long and silvery in color. | Occurs chiefly along Atlantic coast from the Gulf of St. Lawrence to Virginia, and in various northern lakes. | Prized as food because of delicate flavor. When fresh they have an odor resembling cucumbers. |
| Sturgeon | Large salt- and fresh-water fish; slender elongated bodies covered with bony plates. Long snout, small toothless mouth with thick, sucking lips. Large specimens 10 ft. long, and weigh as much as 500 lbs. | Inhabits fresh waters and seas of North Temperate zone. Sea species return to stream to spawn. Food consists of small marine animals, sucked into the mouth. | Prized as food fish. Flesh is smoked and their eggs used in the preparation of caviar. Isinglass manufactured from air-bladder. Supply rapidly declining because of slaughter at spawning time. |
| Sunfish | Many species of bright-colored fresh-water fish, varying in size and color. Bluegill the largest; a foot long and weighs 1 lb. | Found in brooks and ponds from Maine to Florida, and in northern part of Mississippi valley; a favorite with boy anglers. | Flesh sweet and tender. Some species clear a circular place in the mud for eggs, which the male protects. |
| Tarpon | Large sea-fish, somewhat resembling salmon, covered with large silvery scales. Up to 7 ft. in length and 300 pounds in weight. | Found in West Indian waters and off the southern Atlantic coast. Noted for its gamy spirit when caught on hook and line. | Flesh is not highly considered as food; scales are used in ornamental work. |
| Tilefish | Sea-fish about 3 ft. long, weighing 30 lbs., marked with brilliant spots of yellow. Fleshy fin-like appendage over head. | Abundant off the coast of southern New England. First discovered in 1879. | Fish almost exterminated in 1882 when millions were killed in the heavy spring gales. Prized as a food fish. |
| Trout | Fresh-water fish akin to the salmon; includes large lake trout and smaller brook-trout of several species. Minute scales with red or dark mottlings. | Trout live in cold clear streams or lakes with gravelly bottom. Gamy and possess voracious appetites. | Important food and game fish, much sought by anglers. Season is strictly limited by law. |
| Turbot | Large sea-fish of the flatfish group; brown above, whitish below, sometimes reaching weight of 70 lbs. | Ranges from the Mediterranean to the coast of Scandinavia. Feeds on crabs, sea-urchins and fish eggs. Does not occur on American coasts. | Highly esteemed as food; one of the best of flatfishes. |
| Whitefish | Common name of a number of fishes, white or pale color, belonging to salmon family; especially to the whitefish of the Great Lakes, which averages about 4 lbs. in weight. | Inhabits lakes of Northern Hemisphere; feeds on insects and minute organisms. | One of the finest food fishes in America and the most important of its fresh-water fish. |

Playing "NURSEMAID" to YOUNG FISH

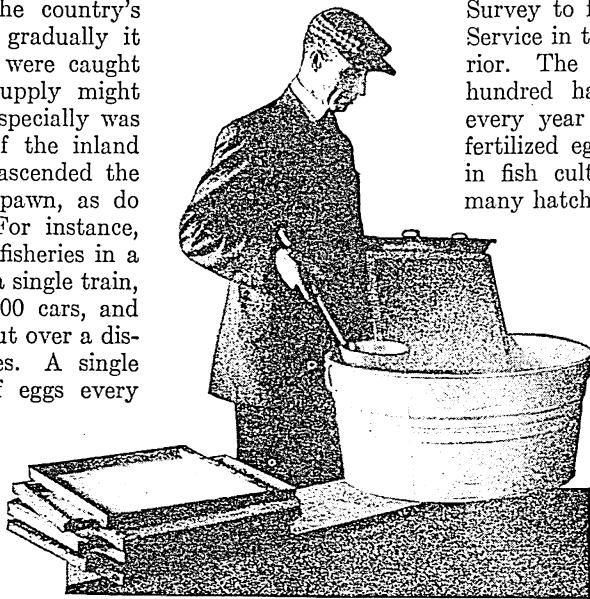
FISH CULTURE. The vast shoals of cod, herring, and other valuable food fishes early discovered in the coastal waters of North America, together with the abundant fresh-water fishes of the interior, greatly aided the country's early development. But gradually it was realized that if fish were caught in such quantities the supply might shortly be exhausted. Especially was this true of the fishes of the inland streams and those that ascended the rivers from the sea to spawn, as do the salmon and shad. For instance, the catch in the Alaska fisheries in a single year, if loaded on a single train, would require about 10,000 cars, and the train would stretch out over a distance of a hundred miles. A single fish often lays millions of eggs every year, but only a very small percentage of these, in ordinary course, hatch and grow to maturity.

Canada established a department of Marine and Fisheries at Confederation (1867), and the United States took up the work in 1871, when Congress created the office of Commissioner of Fish and Fisheries. Even before that date several

of the states had established commissions. The Fish Commission in 1903 became the Bureau of Fisheries in the Department of Commerce. In 1940 it was consolidated with the Bureau of Biological Survey to form the Fish and Wildlife Service in the Department of the Interior. The Service maintains nearly a hundred hatcheries, which distribute every year billions of young fish and fertilized eggs. Canada is also active in fish cultural work, and maintains many hatcheries in every province.

In the hatchery of a fish cultural station, the eggs are contained in long rows of tanks and jars, and through these "incubators" runs a constant stream of water. The eggs are sometimes gathered from the spawning grounds, but more often directly from the fish. In salmon hatcheries the fish, some species of which always die after spawning, are killed before the eggs are removed.

On the Atlantic coast and the Great Lakes the fishermen aid in the work. Often the government spawn-takers go with the fishing



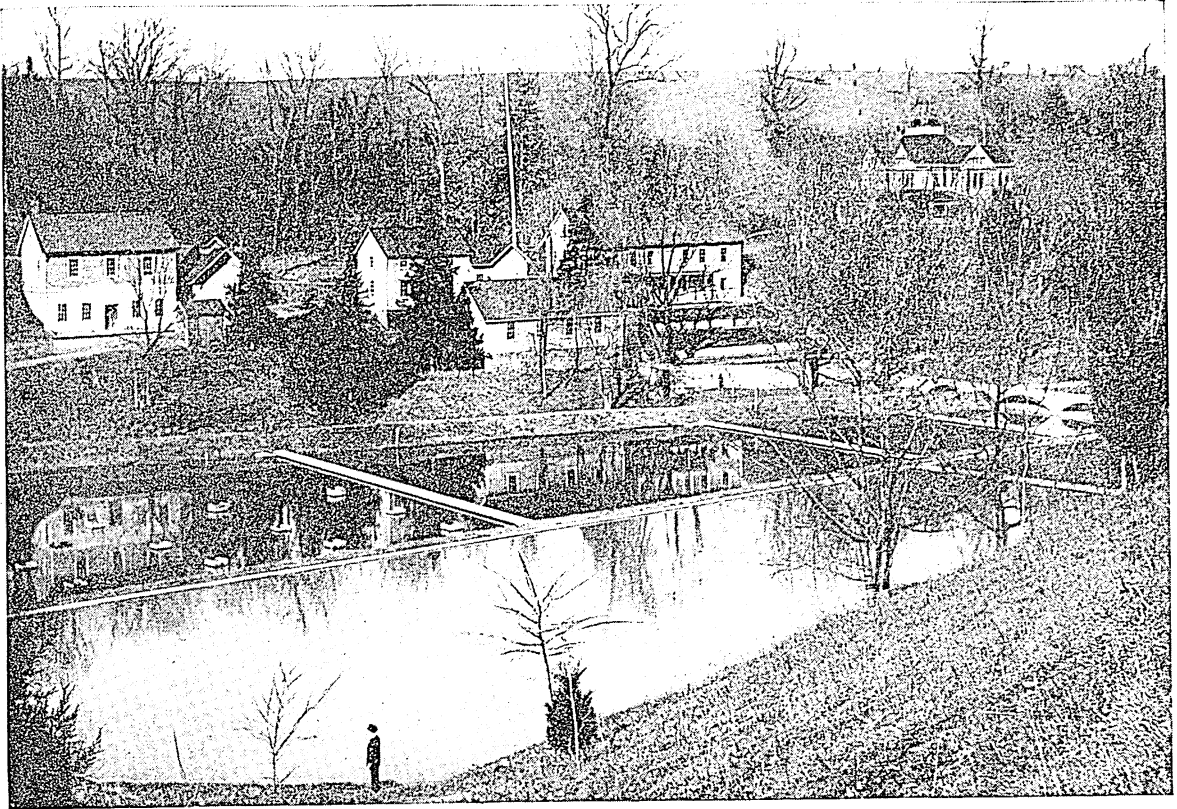
Here is one step in handling trout eggs at a hatchery. The eggs are shipped packed in moss and ice, and are laid out upon screens. The screens are then put in hatching tanks, and a new generation of trout is on the way.

TURNING YOUNG FISH LOOSE TO EARN THEIR OWN LIVING

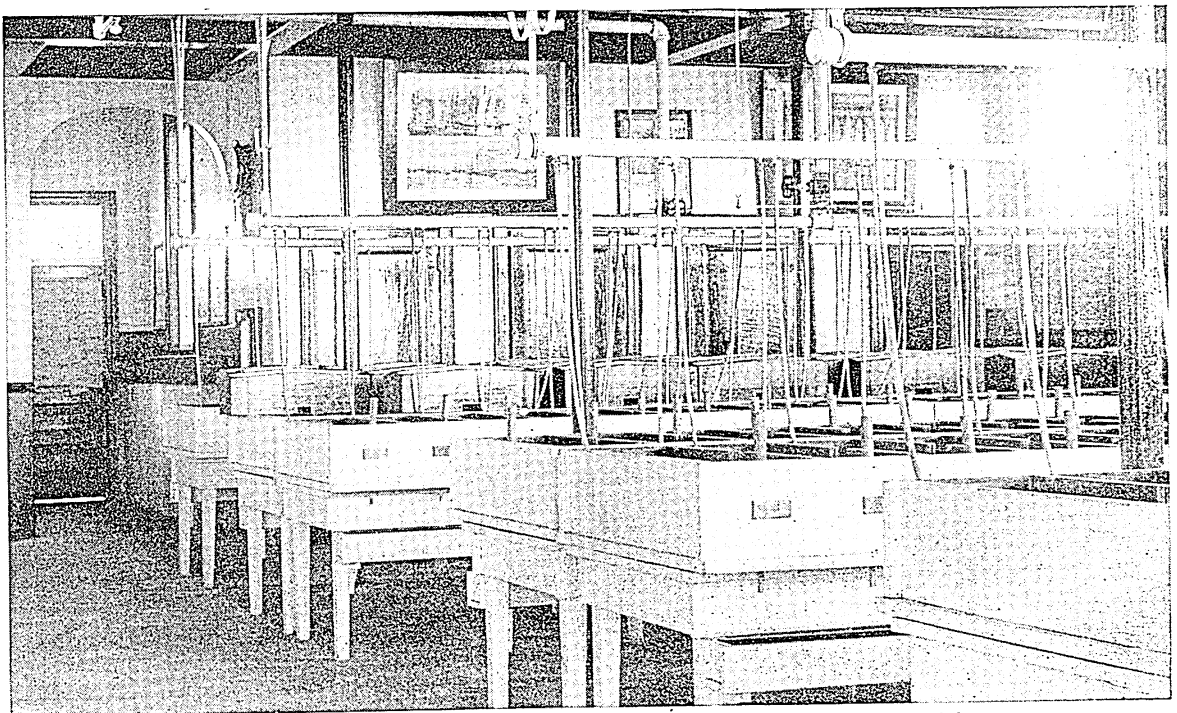


After the hatcheries have nursed young trout to a size where they can shift for themselves, the youngsters are packed in large cans, shipped to the streams which are to be their future homes, and dumped in. They swim away and immediately take up the battle of life, struggling for food, and fleeing their enemies. But the hatcheries have protected them through the most critical period, and so a large proportion of them manage to survive.

TWO FAMOUS FISH NURSERIES



Ponds for rearing young bass at the fish hatchery at Wytheville, Virginia



Equipment for hatching cod eggs in the hatchery at Boothbay Harbor, Maine

fleets, and obtain the eggs from the fish that are caught, in this way saving millions of eggs that would otherwise be lost.

When the fish have hatched they can just wriggle through the wire mesh that covers the ends of the tanks, and this allows them to pass out into the "run" where they grow undisturbed. Until the fish begin to feed they are known as "fry"; until they are an inch long, "advanced fry"; from one inch to a year old they are "fingerlings"; and from one year to two years, "yearlings." It is estimated that only 15 per cent of the eggs are hatched on natural spawning grounds, but in the fish hatcheries at least 80 per cent are saved.

The young fish are carried in tanks in specially constructed railway cars to all parts of the country and liberated in waters appropriate to each kind. The eggs also can be sent long distances packed in moss and ice.

The fish in which the government is chiefly interested are the cod, haddock, pollock, and lobster of the New England coast; the salmon, shad, striped bass, white perch, and yellow perch of the Atlantic streams; the whitefish, trout, and pike perch of the Great

Lakes; the various species of salmon of the Pacific coast; and the numerous trouts, basses, and other food and game fish of the interior waters. The great success that has been attained in this work is due to the long study and careful investigation of the spawning, development, and general natural history of each of the fish handled.

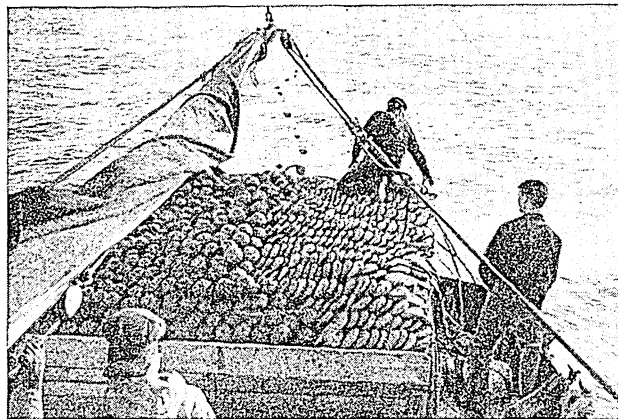
Along the Pacific coast certain streams are closed to the canning industry, so that fish may be unmolested. All salmon canning and salting establishments are taxed by the Federal government, but the tax is remitted if a thousand "fry" are returned to the streams for every ten cases of salmon canned. As a result several private hatcheries have been established by canning interests, and every year these return an enormous total of fish to the rivers.

Other valuable aquatic life, such as oysters, lobsters, terrapin, and even sponges, also come under the protection of the Federal government. Lobsters would be very scarce were it not for the lobster hatcheries that it maintains and the laws passed by the several states prohibiting the sale of lobsters below a certain size. Fully half the oysters marketed are taken from "planted" oyster beds.

WORKERS *with* TRAWL, NET, and LINE

FISHERIES. The "toilers of the sea" have ever been famous as the bravest and hardest of men, venturing in small craft over the wildest oceans, year in and year out. No more romantic picture can be found than the Breton fisherwomen standing watch each season on the rock-bound coasts of northern France, waiting for the peaked sails on the horizon which tell them their men are coming home—counting these

sails, knowing that some will always be missing, peering under their hands for the marks on the canvases that tell the toll of dead, and courageously turning toward the village church to prepare funeral services for those whose bodies lie far away on the Grand Banks of Newfoundland. The hard and dangerous life of the New England fishermen has inspired many a thrilling story, and, indeed, any humble box of salt codfish may have a history to rival the stirring narrative of Kipling's 'Captains Courageous'. In the two World Wars there were no greater heroes than the fishing crews of the North Sea trawlers, who swept those stormy waters—not for fish but for deadly mines—and whose craft figured so



"Paying out" the net is the opening ceremony of the day on a fishing smack. What looks to be a deck-load of coconuts is the net in its storage place, with the wooden floats which support it in the water. A line of the floats can be seen stretching astern.

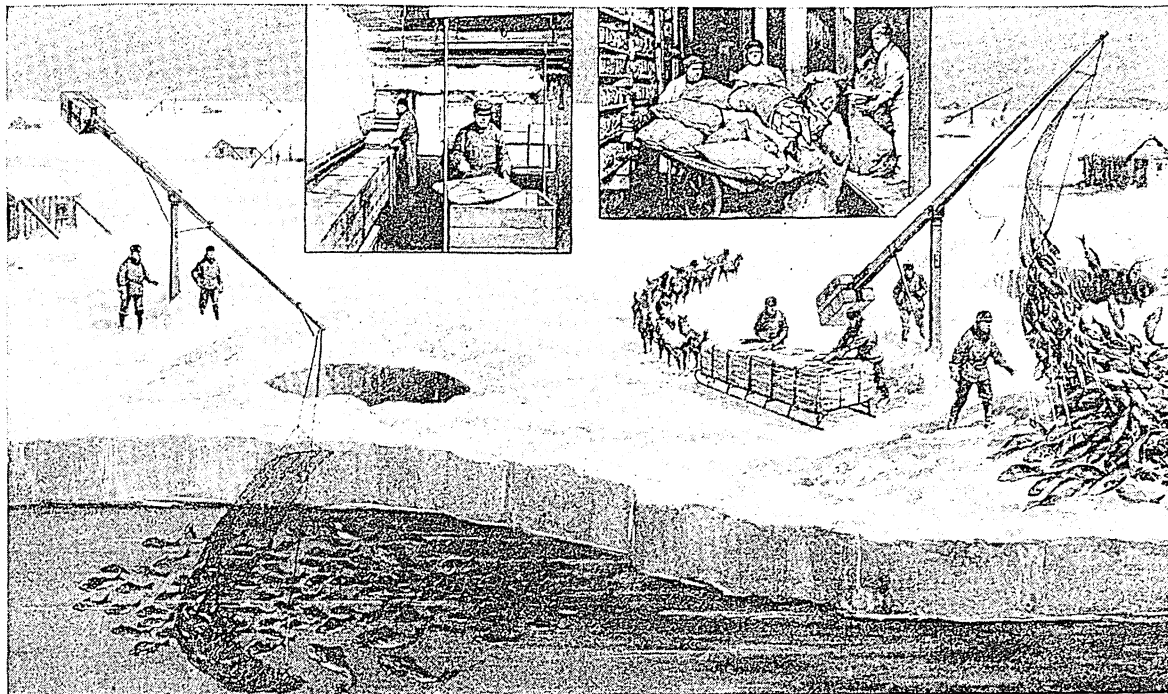
often in the lists of lost or "missing" vessels.

Since the earliest days of history men have fished for their food in seas, lakes, and rivers, and today the catch of the fisherman appears on the dining tables of every country in the world. Fresh fish are boiled, broiled, baked, fried, and even eaten raw, as in Japan, the Pacific Islands, and certain parts of Russia. For future use fish are salted, dried, smoked, pickled, or preserved in

cans, and in these forms find their way to places most remote from their native waters.

Trade in fish is of great antiquity. Ponds in which the ancient Egyptians kept rare foreign fish alive until they were ready for use have been found in Northern Africa. A thriving trade in highly prized lampreys and eels was carried on between Rome and distant portions of the empire, and fish are said to have been imported into Italy in those days from points as far distant as the Caspian Sea. The Mediterranean Sea was always famous for its fisheries, but in recent times the European center of the fish industry has moved to the northern countries. But nowhere are there such varied fisheries as those

HOW FISH CATCH THEMSELVES IN THE NORTHLAND



The ingenious arrangement shown above is used on rivers and lakes in Canada to catch fish in winter. The weighted end of the pole is held up by a trigger-like brace, and the net lowered through the hole in the ice. When the net has snared a large number of fish, the force of their tugging sets off the trigger. The weight immediately falls, and whips the loaded net up through the ice. Men then dump out its contents, and allow the fish to freeze. The frozen fish are packed and shipped in ice to market, as shown in the smaller pictures at the top.

of North America, extending from Massachusetts to Labrador and along the Pacific coast. Deep-sea fishing has been carried on in New England waters for three centuries. In less than seven years after Cabot discovered Newfoundland and reported the cod fisheries there, the French sent over their fishing fleets and paid bounties to encourage the industry. Other nations soon followed and the abundance of food fishes had a great influence on the colonization and development of North America.

The term "fisheries" means the taking of all kinds of water products for commercial purposes, and thus it includes the hunting of whales, seals, and other mammals, as well as the catching or netting of true fishes. It includes also the taking of lobsters, crabs, shrimps, oysters, clams, frogs, alligators, and turtles, and even the gathering of pearls and sponges.

Millions of people the world over are employed in this industry. The countries that have the greatest annual catch are Japan, the United States and Alaska, the Soviet Union, Great Britain, China, Norway, Canada, and India (not always in the order named).

Fisheries of the United States

In the United States and Alaska there are about 125,000 commercial fishermen. Their annual catch is as high as 4 billion pounds, valued at from 80 to 125 million dollars. Boston and Gloucester, Mass., Seattle, Wash., and Portland, Me., are the ports that lead in the value of the annual catch of fish. The

most valuable item in the annual catch is the salmon, which comprises about one-fifth of the total value of the entire United States fishing industry. Oysters, halibut, cod, and haddock come next in importance. The oyster fisheries of the United States are the largest in the world (*see Oyster*).

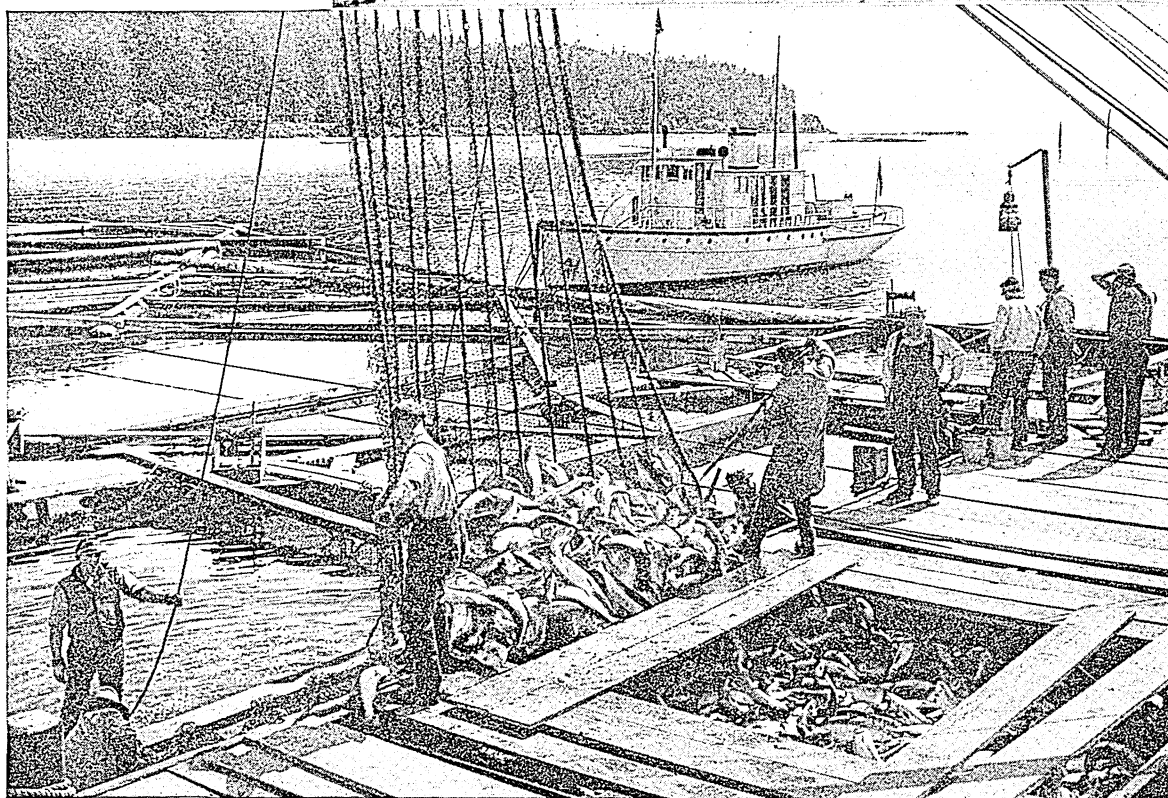
The Great Lakes of North America have the most important of all lake fisheries. Their principal products are whitefish, lake herring, lake trout, pike, perch, and sturgeon. The rivers of the United States, especially the Mississippi and its tributaries, abound in fish. They contain catfish, buffalo fish, black bass, crappies, carp, suckers, and mussels in abundance.

The principal fish taken off the New England coast are cod, haddock, mackerel, pollack, hake, cusk, and halibut. These are called "ground fish" because they feed at the bottom of the sea, and are caught on the shoals or shallow "banks." Some fishing crews still use the older method of fishing with hand lines from the rail of schooners, whose sails must await the will of the winds. The larger vessels carry a number of small "dories" or flat-bottomed rowboats which put off each morning at the fishing grounds manned by one or two members of the crew. The fishing is done with trawl lines which are furnished with five to six hundred hooks baited with squid or herring.

But the day of the schooner is passing. Gasoline power as an aid to sail power has modernized shore fishing. Formerly the men who went to the banks for

CATCHING SALMON FOR THE ALASKAN CANNERIES

The power boat at the right is paying out a purse seine, some 1,500 feet long and 150 feet deep. The other end of the net is attached to a small boat. The purse seiner will circle back, drawing in and closing the net. Below, fishermen are brailing salmon from a trap at the mouth of an Alaskan river. A Bureau of Fisheries patrol boat looks on. The fish swim upstream along an underwater fence which directs them into a series of enclosures. Their instinct to maintain an unchanged course upstream prevents their escape. From the innermost pen they are raised in nets and dumped into scows. This haul contains 20,000 fish.

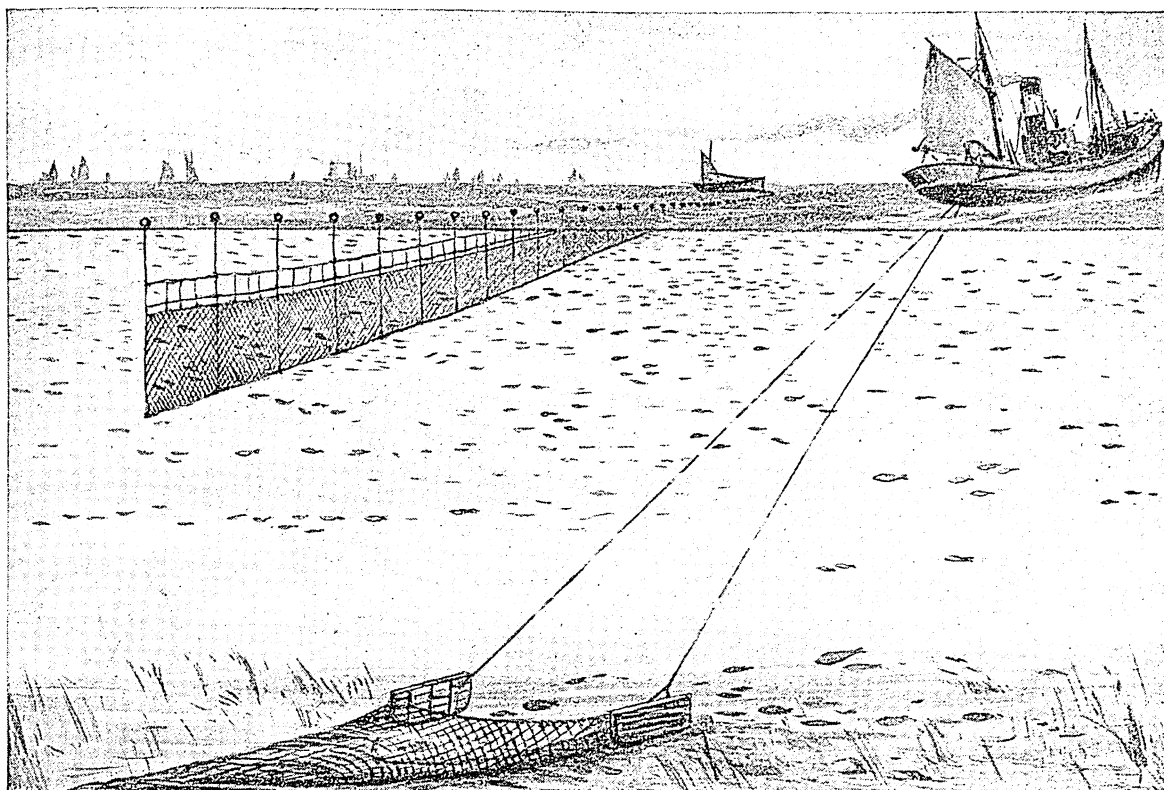


cod were gone about six months. Now the trawlers, propelled by steam or Diesel engines, and equipped with radio outfits, make the trip in six days. They fish with a large conical dredge net or "otter trawl," dragged along the sea-bed from the stern of the vessel. The mouth of the net is kept open by boards at each side which flare apart with the pressure of the water. Every hour or two the cargo is hoisted aboard. As cod spoil rapidly, the fishermen must clean and salt them on shipboard after the day's fishing. This means working far into the night if the haul is large. At port the fish are cleaned again and laid on elevated racks to dry for several days. Each is turned daily to insure even drying. They become as stiff as boards, and are sold by weight. Most of the cod-fish seen on the market is boned, shredded, and packed in boxes.

The cod is omnivorous, feeding on anything that comes its way, though it prefers other fish. Many rare fishes and shells that might not otherwise be known to exist are found in its stomach. Three feet is the average length of the fish, but some may exceed five feet and weigh over 100 pounds. The livers yield cod-liver oil; the air-bladders are used to make isinglass; and the eggs or roe are shipped to Europe to furnish bait for the sardine fisheries.

Mackerel fishing is carried on from April until November in the deep waters between Long Island and the Gulf of St. Lawrence. The mackerel migrates between northern and southern waters. Early in April the "schools" appear off the Virginia coast, where one may recognize them by the rippling water and flocks of seabirds that feed upon the fish. They spawn in the shallow waters of New England and the

INGENIOUS WAYS OF GATHERING THE OCEAN'S CROP



At the top is one of the greatest fishing devices—the gill net. The fish thrusts his head through the meshes which are too small to permit the body to follow; then when he tries to back out, his gills catch and he is trapped. This net is simply set out, with floats on top and weights below, and allowed to become “loaded” with fish. Other nets are drawn through the water by the fishing boats. Sometimes the net has a “draw-string” at the bottom to close it into a “purse” when the ends have been brought together. At the bottom of the picture is shown a dredge net, used to scoop up fish and other creatures from the sea bed.

Gulf of St. Lawrence, and in the late fall journey southward again. Mackerel were formerly taken with a weighted hook called a mackerel-jig, but now great purse-seines or gill nets are used just below the surface of the water. The fleets of fishing “smacks” reach the southern fields early in April and work northward.

How Mackerel are Caught in a “Purse”

The purse-seine used for mackerel is a long strip of netting which stands perpendicularly in the water with floats at the top and weights at the bottom. One end of the seine is fastened by a cable to the ship, the other is towed out by small boats, which travel in a circle amid the school of fish, and back to the ship again. The fish are thus caught in a sort of enclosure near the surface. To prevent them from escaping by diving, a rope which passes through rings around the bottom of the net is drawn tight, puckering the lower edges together and forming a basin-shaped purse, which may then be hauled aboard, or from which the fish can be scooped with hand nets.

The most important fish commercially, exceeding even the cod in world trade, is the herring. The leading herring fisheries today are in Norway, Sweden, France, and Scotland, but the industry is growing

rapidly on this side of the Atlantic, especially in the waters of British Columbia. Maine is the chief center of the New England herring fisheries. Most of the fish caught there are sold fresh, either for food or for cod bait; the remainder is salted or smoked. Certain species of herring range southward as far as Florida and others are found on the Pacific coast, where they are the object of a rapidly extending industry.

Herring constitute 25 per cent of the yield of all European fisheries. These fish travel in great “schools” closely packed together over areas many miles wide. They are caught in nets and huge traps called “weirs.” Large quantities of young herring are packed and sold as “sardines.”

The Great Salmon Fisheries of the Pacific Coast

In the extensive salmon fisheries of the Pacific coast the fish are caught when they are entering the streams from the ocean to spawn. The season usually lasts about five months, but the most valuable fish are those that arrive in the spring. The salmon move near the center of the current, close to the surface. The fishing is done with purse seines, gill nets, beach seines, and traps, and by trolling. The picturesque fish-wheel of the Columbia River is no longer in common use. State and Federal

laws prescribe the time and manner of fishing and provide for a sufficient escapement to insure the maintenance of the salmon runs. Where streams are obstructed by dams, ingenious stairs and elevators enable the fish to go on. Alaska provides about one-half the world's salmon pack.

The shad is an important sea-fish, caught in the bays and estuaries of the Atlantic coast. It is a prized food.

Commercial Uses

Besides the fishes caught for food, many are sought for other purposes. The Chinese catch shark for oil and skins. Many fish like the menhaden or "pogy" are caught for bait, cut up and the pieces put on hooks, or spread over the surface of the sea to lure the fish to the nets. Oil is extracted from the bodies of the menhaden, which in order of weight lead all other products of United States fisheries.

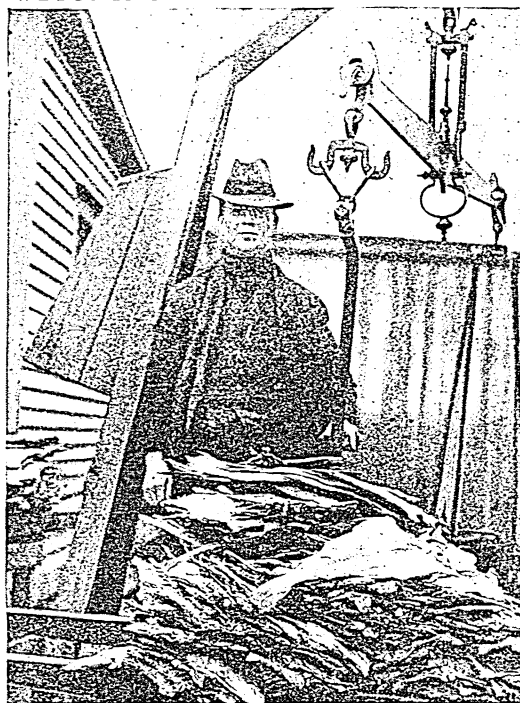
Fish meal, made from ground up bodies of non-edible fish, is used as feed for poultry, pigs, and cattle, and as a fertilizer. Crude fish-oils are used in tanning, soap-making, and tempering steel. Other by-products of the fisheries are glue, isinglass, and an essence derived from fish scales which is used in making the iridescent centers of imitation pearls.

Food Elements in Fish

Nutritional studies show that fish are unusually rich in protein, minerals, and other elements essential to the diet of man, and in a form in which they are easily assimilated. Cod-liver oil and other fish oils are valuable for the vitamin A and vitamin D which they contain. A lack of iodine in food and drinking water is one of the principal causes of common goiter, a disease much more prevalent than most people realize. The fact that fish, especially salt-water fish, contain an abundance of iodine is one of the strongest arguments for frequently including this form of food in the diet.

Radical changes in marketing sea foods have come about in recent years. One of the most important is the process of "filleting." The fillets, thick slices of "fish steaks" ready to cook, are swiftly frozen and packed with ice in insulated cartons for shipment. Packaged fish now reach the most distant markets, and families far inland may purchase fish as fresh and delicious as that sold in seacoast towns. (See also Herring; Lobster; Oyster; Salmon; Swordfish; Whale.)

WEIGHING THE FISH FOR MARKET



Stiff as boards, these dried codfish are ready for shipping. Each year 6,000,000 pounds of salted fish are spread out to dry on the wharves of Gloucester, Mass., alone, and sold by weight to dealers who supply a world-wide market. Other fishing centers also dry huge quantities.

FITCH, JOHN (1743-1798). One of the early experimenters with the steamboat was John Fitch, a native of Windsor, Conn. A restless and versatile man, he was at various times sailor, clockmaker, brass founder, silversmith, surveyor, and mapmaker. During the American Revolution he was a sutler, following the army and selling goods to soldiers. As early as 1785 he petitioned several state legislatures for aid in building a steamboat, and exhibited a side-wheel model, but money was scarce. However, in 1786 he formed a company and soon after launched on the Delaware a boat propelled by six mechanically driven paddles on each side. He continued to experiment, and in 1790 had a boat which was put into regular service between Philadelphia and Trenton, N. J. After a few months' operation, this vessel was wrecked and Fitch's backers refused further support. Eight years later, poor and embittered, Fitch took poison and died at Bardstown, Ky.

FIUME (*fē-q'mě*). On the eastern Adriatic coast 40 miles southeast of Trieste, lies Fiume—a sunny, easy-going city which one would never suspect of being an international trouble maker. However, from the time it was captured by Charlemagne in 799, it has had a disturbed history and has shifted to various owners, going finally to Hungary, which developed it as its seaport. After the World War Fiume threatened to become the cause of a new war between Italy and Yugoslavia. Both countries claimed it, Italy on the ground that the population of the city (excluding the suburb Susak) was strongly Italian, and Yugoslavia on the ground that geographically it was part of Croatia, one of the Yugoslav territories, and was that country's natural and necessary outlet to the sea.

The situation was further complicated in September 1919, when Gabriele d'Annunzio, the famous Italian poet and war hero, with a small volunteer band, seized and held the city in defiance of the world. Even after an agreement was reached (Treaty of Rapallo, 1920) making the city independent, D'Annunzio held out, yielding only under force. At last, in 1924, a new treaty was signed giving Fiume definitely to Italy, and Porto Barros to Yugoslavia. In 1927 Italy granted Hungary port privileges in Fiume. The chief exports are wood, sugar, and rice. Population, about 50,000.

PROUD EMBLEMS *of* NATIONAL POWER

"I SWING before your eyes as a bright gleam of color, a symbol of yourself, the pictured suggestion of that big thing which makes this nation. My stars and my stripes are your dream and your labors. They are bright with cheer, brilliant with courage, firm with faith, because you have made them so out of your hearts." This, said Franklin K. Lane, a member of President Wilson's cabinet, is the real meaning of Old Glory, the banner of the United States; for the flag is but a symbol of the nation. Whatever the flag to which you give allegiance, you are, in a very real sense, one of its makers, as you are of the nation for which it stands. In this article you will read something of the history of these emblems for which men are ever ready to yield their lives, and especially the history of the American flag and the observances that are connected with it.

A SALUTE TO THE NEW FLAG

"Old Glory" was a new glory to American eyes when it was raised over Fort Stanwix, New York, on Aug. 2, 1777, one of its earliest appearances.

FLAGS. All sorts of objects, from a wisp of straw to an umbrella, have served as flags to the long procession of fighting tribes and nations and armies which moves through history from the mistiest centuries to the present day.

The very human wish to establish one's identity, to stamp one's possessions with a personal mark, to embody in a symbol the pride and hopes and courage of one man or a group of men, has been the origin of flags.

Probably the tribal or family symbols came first, such things as totem poles, which are in a sense flags, boasting of the prowess of ancestors and claiming descent from gods or ferocious beasts. A totem pole, however, or a huge carved image of tribal significance was too unwieldy an object to be carried into battle.

Smaller images mounted on poles or spears were no doubt the first flags. Old carvings and paintings and tales tell us that the pharaohs carried great feather fans at the head of their troops, just as did the Aztecs, who admired the bright green plumage of the quetzal bird (see Quetzal). The Assyrians bore aloft disks on which appeared a running bull. In Greece the people of Athens carried the image of an owl, those of Crete a minotaur, of Bœotia a bull, of the Peloponnesus a turtle.

According to Homer, Agamemnon waved a purple veil as a signal to rally the Greeks, certainly one of the earliest signal flags recorded in the history of nations.

Rome's Wisp of Straw

Strange to say, the first battle flag of gorgeous Rome was merely a wisp of straw tied on a pole. In later years the dictators sent out their troops under the emblem of a hand raised on a staff, and still later the hand gave place to figures of horses, wolves, minotaurs, bears, and eagles. During the second consulship of Marius, he ordered that the eagle, the bird of Jove, should alone lead the soldiers of Rome. The Roman eagle was famous for years. Then the Romans adopted the dragon of Parthia, and carried it in their conquest of

Britain, where its descendant can still be seen today in the red dragon on the flag of Wales.

The raven of the Northmen was also first carried as a figure on a spear, and later painted on a flag. African tribes have carried all manner of tribal emblems, and some chiefs in Africa adopted umbrellas to serve as their royal standards.

In addition to the eagle, the Roman cavalry carried the vexillum, a genuine flag, made of a square piece of fringed cloth hung on a cross-bar at the end of a spear. The emperor Constantine likewise carried his imperial standard, or labarum, in this manner. In fact, flags in Europe were not attached at the side to a staff until the Europeans saw the invading Saracens carry their flags in this way, and copied the side attachment, which permits a flag to flutter in a lively way but partially conceals the design.

Banners of War

It was the custom of the Romans to hang flags of victorious battles in their temples, and through the Middle Ages up to modern times flags have also been hung in Christian churches to celebrate success in war. In most cases they were to remain in the church untouched until the last piece of fabric had dropped from the flagstaff.

Although most flags have carried their symbolism in their design, many flags also display an inscription or motto. One of the oldest of these was the sacred standard of the Maccabees, carried by the Israelites in addition to their tribal banners. It bore the initial letters of the Hebrew text, "Who is like unto Thee, O Lord, among the gods?"

Usually it is the design which tells the tale, and often the story is most romantic, bordering on the legendary, secured by its date against proof or disproof. For instance, the red stripes of the standard of monarchical Spain represented the streaks made by the four fingers of Charles the Bold as he dipped them in the blood of Geoffrey, Count of Barcelona, and drew them across the fallen Count's golden shield, after a battle in 873 A.D.

The many stories surrounding the fleur-de-lis of France are even more remarkable. On the night before

the battle of Tolbiac, in 496, Clovis is said to have dreamed that the golden toads on one of his banners changed to golden lilies. Someone did later change them to lilies, and the lilies glittered over France for centuries. Then Napoleon, perhaps somewhat maliciously, found in the conventionalized fleur-de-lis a resemblance to bees, and in the imperial standard he changed the lilies to golden bees, and made them symbols of unquestioning devotion to imperial service. From toads to lilies to bees seems a record metamorphosis.

The first French oriflamme, from which originated all other oriflammes, also grew out of the perils of war. The same Clovis who had the dream of lilies used to carry as a battle flag, after his conversion to Christianity, the cape of St. Martin, the half of that very cloak of blue which St. Martin divided with a beggar at the gate of Amiens. This flag was believed to bring victory in war, but on various occasions it failed to do so. Late in the 11th century, when William Rufus of England was about to invade the Vexin, a part of the Seine valley, Prince Louis of France marched out to meet him under the oriflamme of the abbey of St. Denis, where he had been educated. This banner was bright red, on a golden staff, its fly end slashed into three tongues like flames. The name oriflamme means "golden flames." Since Louis was successful against William Rufus, the flag was regarded as a bright bringer of victory, and remained the chief flag of France until 1413 in the reign of Charles the

Well-Beloved, when the English entered Paris.

In spite of its long popularity, it had often been lost; by Philip the Fair at Mons in 1304; by St. Louis in the Seventh Crusade; by Philip of Valois at Crécy; and by John at Poitiers when the Black Prince's men took it from beneath the body of Geoffrey de Charny, fiftieth bearer of the oriflamme. The last time it was carried in battle was at Agincourt, in 1415. Of course, it was never the only flag carried by French soldiers, but for a time it was their foremost flag.

Some of the most famous flags have not represented nations or kings, but cities and guilds of workmen.

THE FLAG GOES BY

Hats off!

*Along the street there comes
A blare of bugles, a ruffle of drums,
A flash of colour beneath the sky:*

Hats off!

The flag is passing by!

*Blue and crimson and white it shines,
Over the steel-tipped, ordered lines.*

Hats off!

*The colours before us fly;
But more than the flag is passing by:*

*Sea-fights and land-fights, grim and great,
Fought to make and to save the State:
Weary marches and sinking ships;
Cheers of victory on dying lips;*

*Days of plenty and years of peace;
March of a strong land's swift increase;
Equal justice, right and law,
Stately honour and reverend awe;*

*Sign of a nation great and strong
To ward her people from foreign wrong:
Pride and glory and honour,—all
Live in the colours to stand or fall.*

Hats off!

*Along the street there comes
A blare of bugles, a ruffle of drums;
And loyal hearts are beating high:*

Hats off!

The flag is passing by!

—Henry Holcomb Bennett.

Some of the gild flags bore obvious devices, such as the black flag with three white candles of the candle makers of Bayeux, or the crowned fishes on the fish-mongers' flag. More entertaining were the lawyers of Laval, whose blue banner had a device of three golden mouths. The flag of the mercers showed the Virgin drying her hair, the salters' banner displayed three boiled eggs, and the gardeners' flag provided Adam with a spade.

Flags Grow Longer

In the heyday of flags, in the age of chivalry, banners were at first square, then oblong, and for a time the size of the banner indicated the rank of the owner. The tendency in recent years in national flags has been for them to grow longer and narrower, more in the proportions of the American "Stars and Stripes," which is very nearly twice as long as it is wide. Pennants have of course always been narrow, ribbon streamers. That of a British warship is 20 yards long and but $4\frac{1}{2}$ inches wide. Formerly, when a ship came into port to pay off, it flew its longest pennant, with a bladder attached, so it would stream out full length.

Many and strict are the rules of heraldry with regard to the design, use, and meaning of flags, rules which have often been freely disregarded in the New World at the crucial moment when a new flag was being made. A commonly observed rule, however, is that which considers the upper corner of the flag on the side attached to the pole as being the "point of honor." As the observer faces the flag, this corner

appears to him to be the upper left-hand corner of the flag. It is never so described in heraldry, but is always called the upper right corner, because it is the upper right corner from the point of view of the flag itself.

A Flag Has a Sword Arm

Much of the mystery of the rules on flag display is cleared by remembering that a flag, from the days of old, has been regarded as a living being. It must always be placed so that, if it were a man, it would be facing the observer. Its upper corner, which would correspond to a right arm, is the "point of honor" because the right arm is the sword arm. That is why the blue field of stars in the flag of the United States stands where it does, as a "sword arm," in the position of honor. Since a flag is used as the symbol of a nation, and its design often tells an eloquent story of the country's history and ideals, flags in all times have been fiercely defended, and an insult to the flag is resented even more deeply than offense to a citizen or even an ambassador. Torn, dim battle flags have been the theme of many a patriotic poet, among the most notable of American contributions being the verses by Moses Owen which include the following famous lines:

Nothing but flags—but simply flags
Tattered and torn and hanging in rags;
Some walk by them with careless tread,
Nor think of the hosts of patriot dead
That have marched beneath them in days gone by
With a burning cheek and a kindling eye,
And have bathed their folds with their life's young tide,
And, dying, blessed them, and, blessing, died.

Flags in United States History

IN SPITE of its comparatively short national life, the United States has produced an astonishing number of flags. In the agitated years before and during the Revolution, flags blossomed everywhere, banners defiant alike of tyranny and of heraldry. Nations whose history covers many centuries have scarcely a larger collection of flags to display. Many of these faded old flags of America's early days are preserved today as precious tokens, and much scholarly research has been expended to learn something, from letters hastily jotted down, of the stirring events and patriotic sentiments that accompanied the creation of the flags.

Some of the more interesting and important of these historic flags are shown in color on page 90, and in the explanation of their origin on pages 98, 99, and 100 is set forth the thrilling tale of the quaint banners that flew over the heads of the hungry and footsore revolutionists, and those who fought in

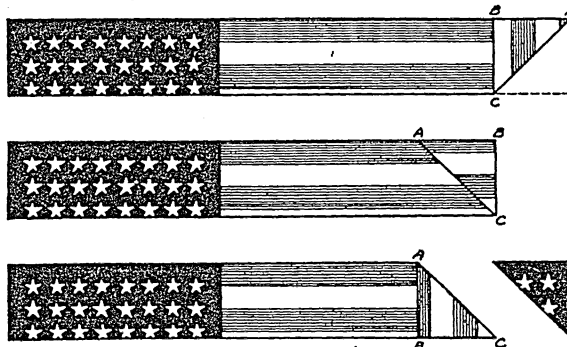
later wars. The crooked lettering in Perry's flag on Lake Erie, the ungrammatical Latin motto on Pulaski's revolutionary banner bear more eloquent testimony to their simple impulsive loyalty than would some carefully devised artistry of design. Strange to say, we know rather more about the oldest and obscurest of our ancient flags than we do about the origin

of the design of the "Stars and Stripes." The idea of representing the 13 colonies by 13 stripes was present in the old flag of the Philadelphia Light Horse Troop. But who first actually thought of combining the stripes with a blue, starry field? No one can truly say.

One of the tales told about the origin of the stripes is somewhat unromantic, but has a most plausible sound. It is said that, at a dinner on Dec.

13, 1775, Benjamin Franklin suggested adapting for use of the colonies the flag of the East India Company, which had horizontal stripes, and the union of

HOW TO FOLD THE FLAG

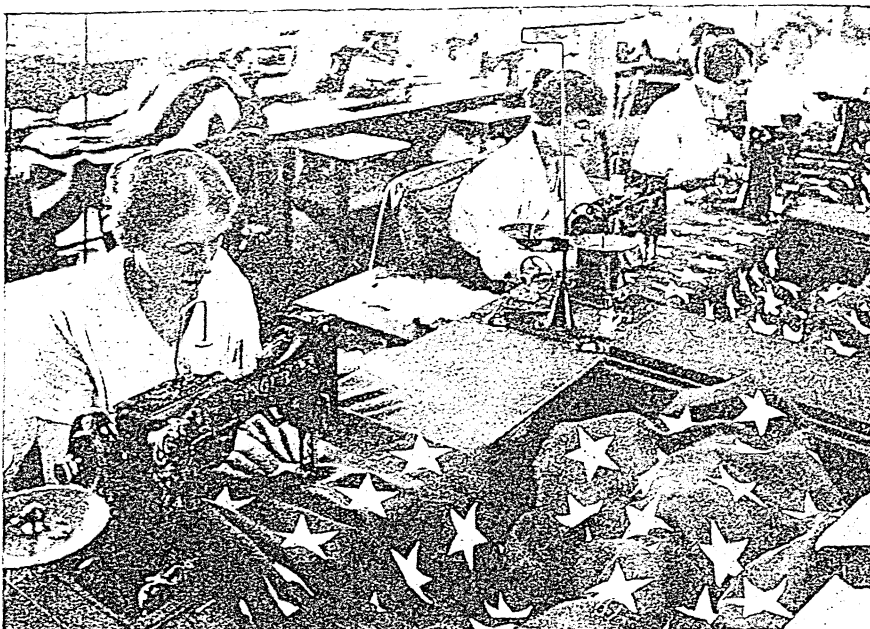


In military circles there is a special way to fold the United States flag. After it is folded lengthwise into four thicknesses, it is "triangled," as above, into a cocked hat shape.

England in the upper canton. Just such a flag was used as the first American navy ensign.

Whether Old Glory was derived from a tea-ship flag, or was an original conception, it is one of the most beautiful and distinctive flags of all time. It likewise possesses the unique ability to "grow with the country," since a new star appears in the blue on the July 4 following the admission of a new state. Indeed, the first thought was to add new stripes as well as stars, but when the number of stripes in the flag had increased to 18, the effect on its shape was so bad that the original design had to be restored. The facts of chief significance in the origin of the United States flag will be found in paragraph 22, page 91. Historians have likewise tried to determine the date of the first official display of the

WHERE FLAGS ARE MADE BY THE HUNDREDS



Betsy Ross and her aides would be amazed to see how their Uncle Sam can turn out American flags for the army and navy. The stripes are cut, dozens at a time, with an electric cutter, and the stars stitched in place, one on each side of the blue field, with a zig-zag sewing machine.

United States flag, as well as other "first" dates in its history. The accompanying list cites the most important and interesting of these occasions.

"FAMOUS FIRSTS" OF THE UNITED STATES FLAG

First Displays of the Flag

July 2, 1777: By John Paul Jones on the ship *Ranger*, at Portsmouth.

Aug. 2, 1777: Over Fort Stanwix, N. Y.

Sept. 3, 1777: At Cooch's Bridge, 14 miles southwest of Wilmington, Del.

Sept. 11, 1777: At the Battle of Brandywine, the United States flag first flew in offensive land warfare.

Jan. 28, 1778: On Fort Nassau, Bahama Islands, when the Americans captured the fort from the British.

Feb. 3, 1783: The *Bedford of Massachusetts* was the first ship to sail into the river Thames, a British port, displaying the United States flag.

Sept. 13, 1784: Capt. John Greene of the *Empress* first displayed the United States flag on the Canton River, China. The natives said it was as beautiful as a flower and referred to it as the "flower flag" for many years.

Sept. 30, 1787 to Aug. 10, 1790: The American ship *Columbia* sailing from Boston was the first sailing vessel to carry the flag of the United States around the world.

April 27, 1805: Lieutenant O'Bannon and Midshipman Mann hauled down the Tripolitan flag and hoisted the flag of the United States over the batteries of the town of Derne, Tripoli, the first display over a fort of the old world.

May, 1812: The United States flag was first displayed over a schoolhouse at Catamount Hill, Colerain, Mass.

April 13, 1818: The flag described in the law of April 4, 1818, was hoisted over the House of Representatives at two o'clock on this date, although the law provided that the act was not to take effect until July 4, 1818.

May 22, 1819: The first steamship to carry the United States flag over the Atlantic, the *Savannah*, left the port of Savannah, Ga., for Liverpool.

Oct. 18, 1867: At the taking over of Alaska by the United States, the flag was first flown in Alaska.

Nov. 10, 1871: Henry M. Stanley was the first explorer to carry the flag into the interior of Africa.

May 12, 1898: The flag was first raised over Point Arbolitas, Cuba.

Aug. 13, 1898: The flag was first raised at Manila by Lieutenant Brumby of the Navy.

July 29, 1918: The first United States National Color carried by a regiment to be decorated by a foreign power was that of the 104th Infantry.

First Foreign Recognition

The first 13-gun salute by a foreign country in a foreign port to the Continental Congress was rendered by Johannes de Graef, Commander of the Dutch island St. Eustatius, Nov. 16, 1776, to the *Andrew Doria* commanded by Captain Robinson. The following list indicates early instances when the flag received salutes:

Oct. 17, 1777: By the British at the surrender of Burgoyne's army.

Feb. 14, 1778: A salute of nine guns from the French fleet under Admiral La Motte Piquet in answer to a salute of 13 guns given by John Paul Jones as he entered Quiberon Bay near Brest, France.

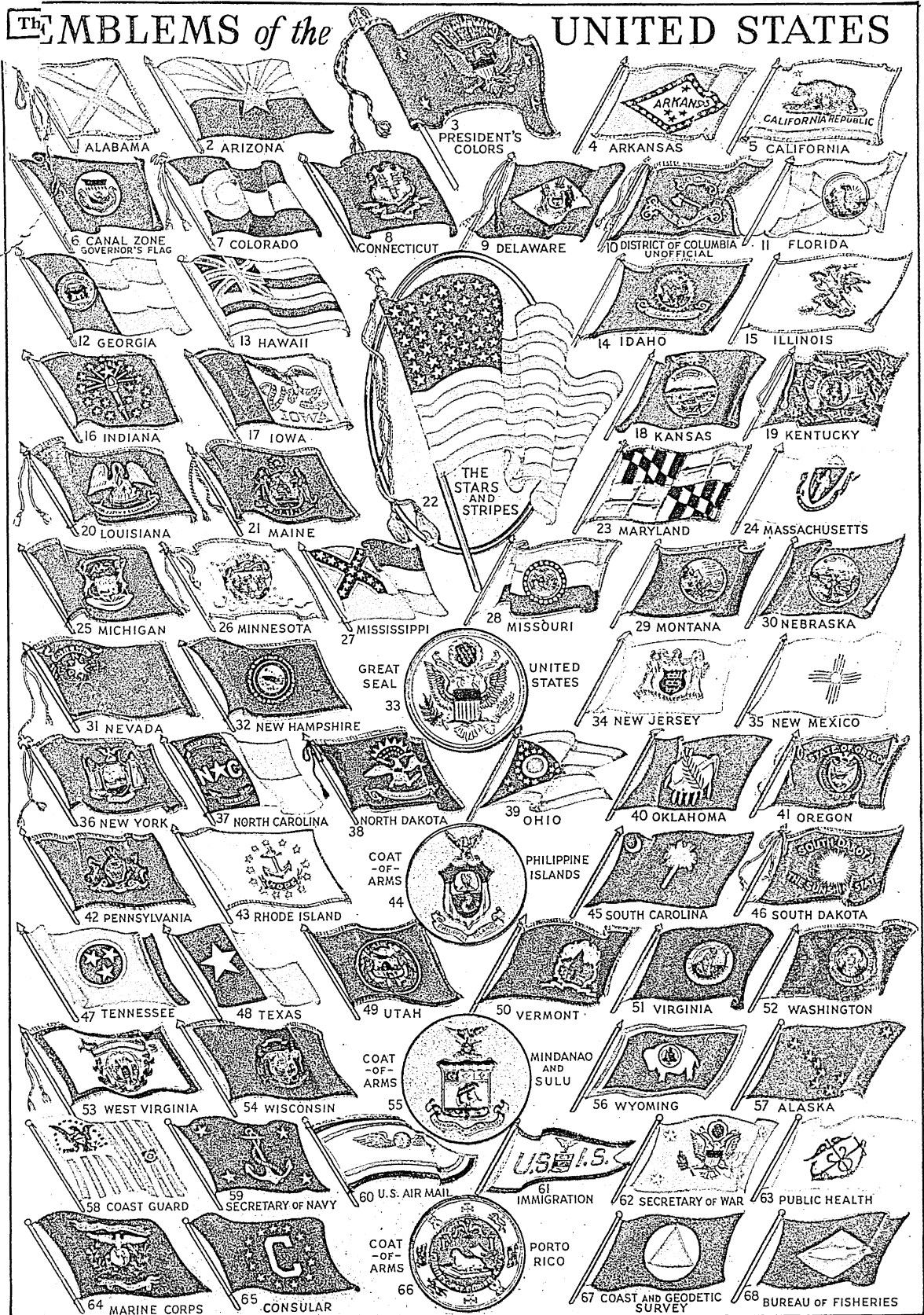
April 24, 1778: John Paul Jones was the first officer of the American Navy to compel a British man-of-war to strike her flag to the flag of the United States.

First Flag Days

June 14, 1861: At Hartford, Conn., was the first time Flag Day was observed.

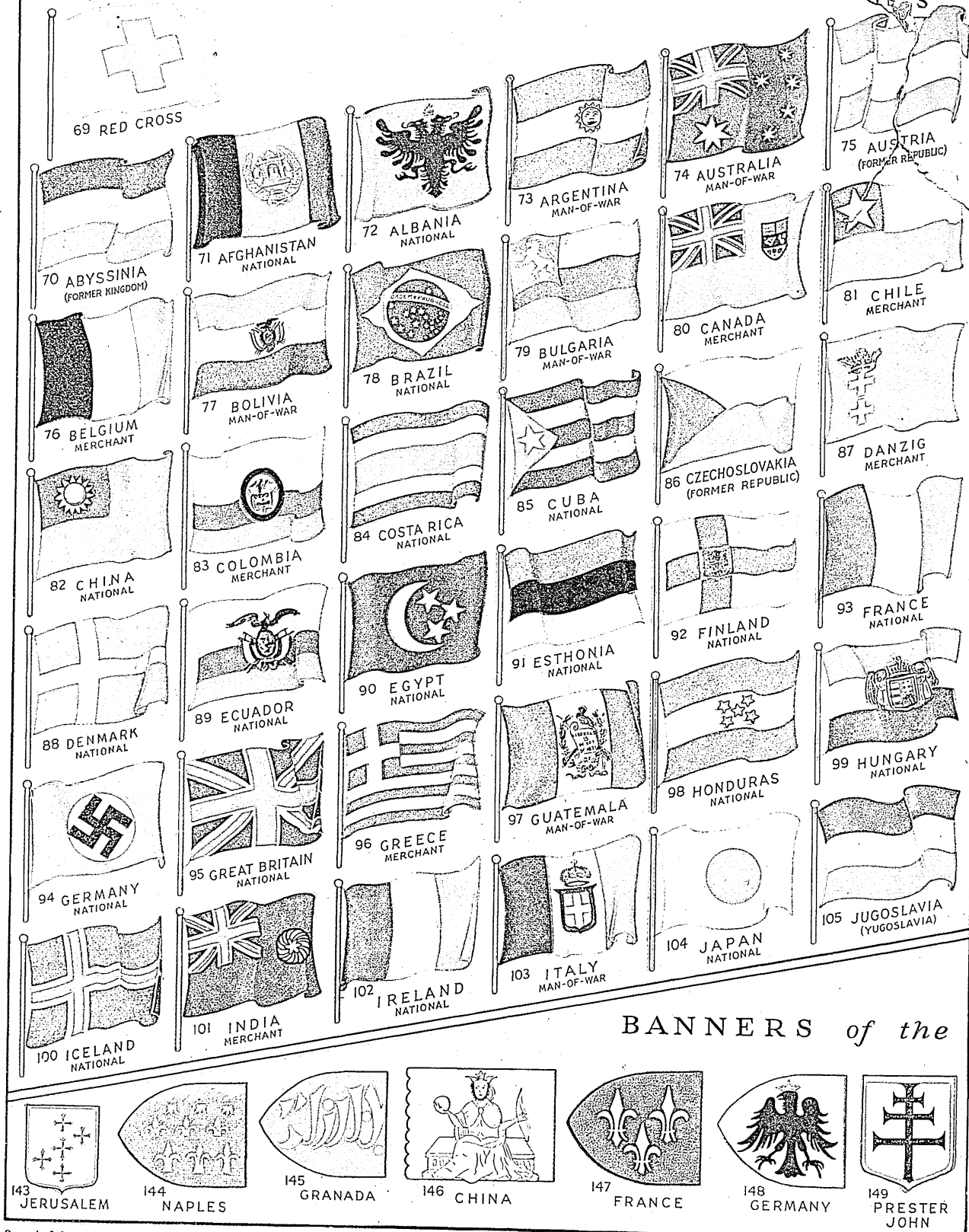
June 14, 1893: At Philadelphia was the first time Flag Day was celebrated in the public schools.

THE EMBLEMS of the UNITED STATES



DRAWN FOR COMPTON'S PICTURED ENCYCLOPEDIA BY J.M. ETTWEIN - STAFF ARTIST

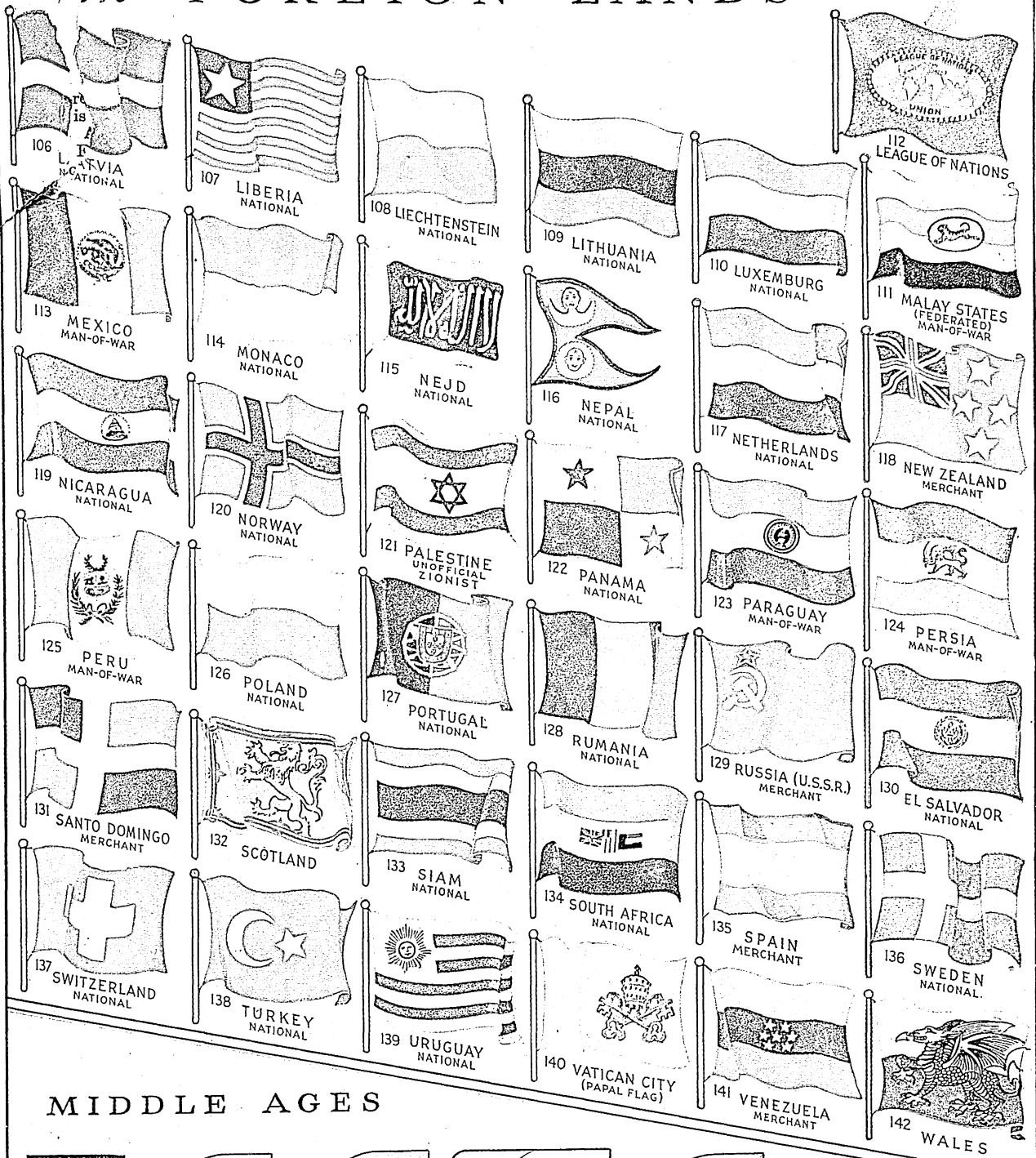
FLAGS THAT WAVE ^{ITS}



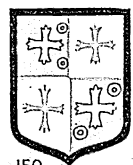
BANNERS of the

Several of the nations represented here have recently lost their independence, but their flags are shown as a matter of historical interest.

The in FOREIGN LANDS



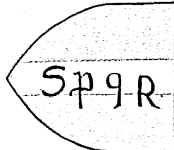
MIDDLE AGES



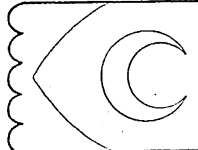
150 CONSTANTINOPLE



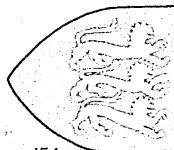
151 FLANDERS



152 ROME



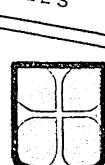
153 DAMASCUS



154 SCOTLAND



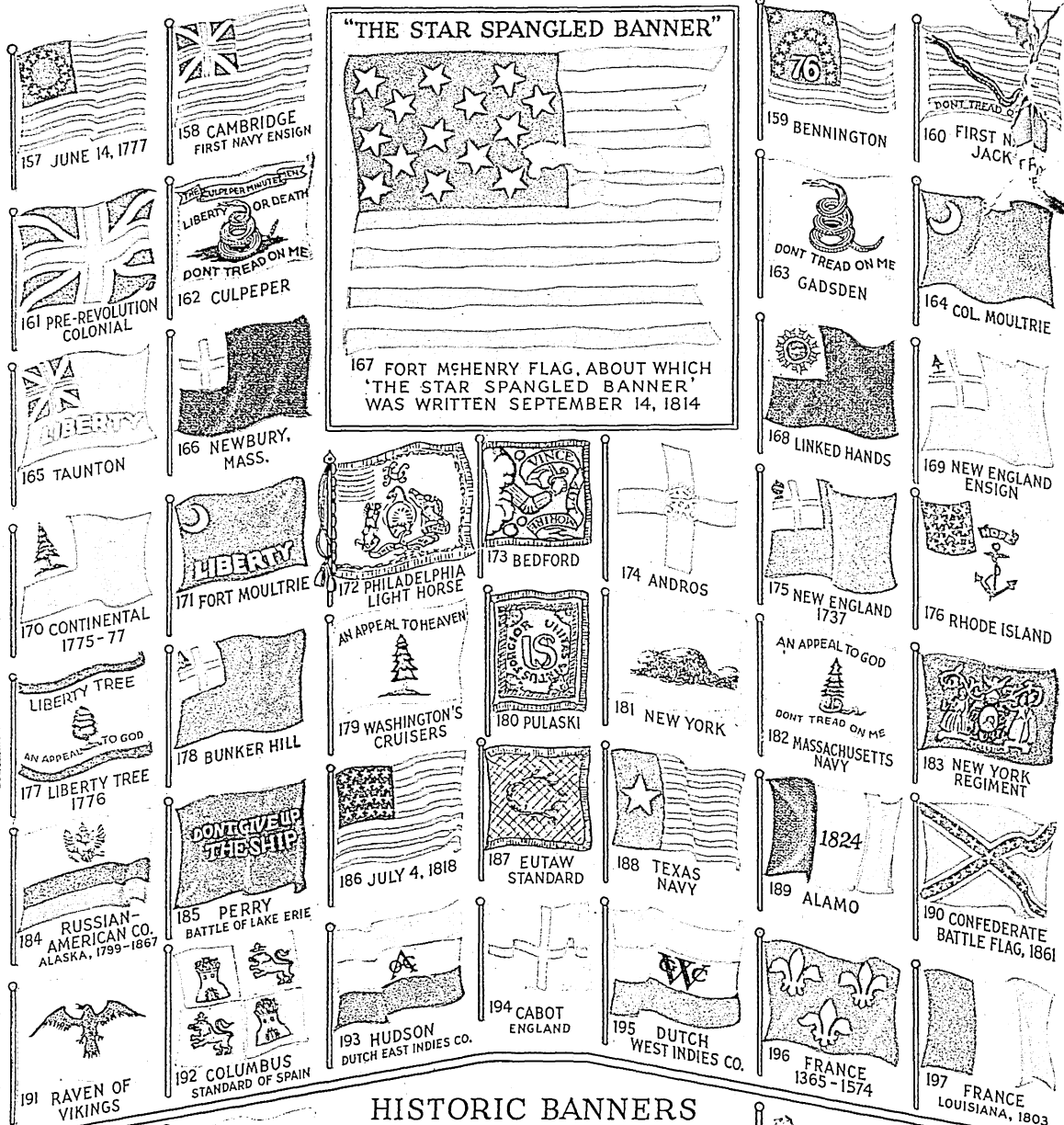
155 ALEXANDRIA



156 RHODES

FAMOUS FLAGS *in* AMERICAN HISTO

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D S



HISTORIC BANNERS *of* LATIN AMERICA



Flags of All Nations and Their Romantic Stories

Emblems of the United States

1. **Alabama.** Adopted Feb. 16, 1895. The cross of St. Andrew also appears on Confederate battle flag (see 190) and is part of British flag.

2. **Arizona.** Flag of battleship *Arizona*, adopted as state flag Feb. 27, 1917. Four feet high and 6 feet long, with 2-foot copper star of Arizona rising from blue field, in face of setting sun. State's colors, blue and gold, are joined with old Spanish colors, red and gold.

3. **President's Flag and Colors.** Adopted May 29, 1916. The president's personal seal appears on blue field with 5-pointed white star in each corner. The usual flags are of bunting without fringe; the "colors" and automobile flags are silk with a gold and white fringe. When the president visits a United States vessel-of-war, his flag is displayed on mainmast the moment he reaches deck and flies so long as he is aboard. If the ship can do so, national salute of 21 guns is fired on his arrival and again when he departs. His flag is lowered with last gun of the parting salute. When president is embarked in a boat, he usually has his flag displayed at bow. When he passes in boat flying his flag, naval vessels parade the full guard, four ruffles are given on drum, four flourishes are sounded on bugle, 'Star Spangled Banner' is played by band, and officers and men salute. All saluting ships, on meeting a ship flying the president's flag at sea or elsewhere, fire a national salute on passing; all naval batteries salute him in the same fashion. At military post, camp, or station, the president is received with regimental colors or standards; officers and troops are at salute, drums give four ruffles, and bugles sound four flourishes; national anthem is played, or in absence of band, bugles sound 'To the Colors,' and a salute of 21 guns is fired. Upon his departure, another 21 guns are fired.

4. **Arkansas.** Adopted April 10, 1924. The 25 stars show Arkansas was 25th state in Union. Three blue stars below "Arkansas" typify the three nations, Spain, France, and United States, to which the state successively belonged, and indicate also that it was the third state carved out of the Louisiana Purchase. Of these three stars, the twin stars side by side typify Arkansas and Michigan as twin states admitted to the Union together on June 15, 1836. Star above "Arkansas" commemorates Confederacy; the diamond arrangement signifies that Arkansas is the Union's only diamond-bearing state.

5. **California.** Adopted Feb. 3, 1911. Length is one and one-half times its height; upper five-sixths of height is white and lower one-sixth red. Dates from days of California pioneers and shows largest of bears, the extinct California grizzly. Bear is one-third the flag's length.

6. **Canal Zone (Governor's flag).** Approved June 8, 1915. Shows seal of Panama Canal, a Spanish galleon of 15th century passing through Gaillard Cut. Upper half of shield represents seal of United States. Below are words "The Land Divided, the World United."

7. **Colorado.** Adopted June 5, 1911. Height is two-thirds of its length. The golden disk filling center of "C" should be one-sixth width of flag, but larger "C" is always used. Flag has a cord of gold and silver intertwined, one tassel gold and one silver.

8. **Connecticut.** Adopted June 9, 1897. Height 4 feet 4 inches, length 5 feet 6 inches. State shield shows three grape-vines to represent three original colonies of Connecticut—Hartford, Windsor, and Wethersfield. Below is state motto "Qui Transtulit Sustinet" (He who brought us over sustains us)—an inscription from state's colonial banner.

9. **Delaware.** Design selected July 24, 1912, not adopted by legislature but accepted as official. Buff diamond contains state coat-of-arms. Below is inscription "December 7, 1787," date Delaware ratified Federal constitution. Delaware was first state to do so.

10. **District of Columbia.** No official flag, but that of Militia is frequently so regarded. Small hatchet in center is

said to refer to story about George Washington and the cherry tree.

11. **Florida.** Adopted November 1900. Height three-fourths length. Red cross of St. Andrew has bars one-eighth as wide as length of flag. State seal in center adopted Aug. 6, 1868, shows sun's rays over highland in distance, a coconut tree, steamboat on water, and Indian woman scattering flowers; seal encircled by words "Great Seal of the State of Florida" and "In God We Trust."

12. **Georgia.** Adopted Oct. 17, 1879. State seal, added Aug. 22, 1905, shows three pillars with "Wisdom, Justice, Moderation," typifying legislative, executive, and judicial branches of government. Arch above pillars is inscribed "Constitution 1861." The whole is encircled by "State of Georgia, 1799." As in case of Colorado flag, design described by enabling act differs from actual flag as hung in court of Postoffice at Washington, D. C.

13. **Hawaii.** Adopted March 13, 1903, by Territory of Hawaii. Crosses of St. Andrew, St. George, and St. Patrick in field as in colonial flag (see 161). Hawaii is the only American soil over which this old British emblem still floats.

14. **Idaho.** Authorized March 12, 1907. Center coat-of-arms is moose-crested escutcheon with a blazing sun rising above three mountain peaks and a river in foreground. On one side is miner with pick and shovel, on other woman bearing scales and torch of liberty. Above crest is a scroll of white with legend in red "Esto Perpetua" (May she endure forever).

15. **Illinois.** Authorized July 6, 1915. Height 3 feet, length 5 feet. State seal, adopted 1819, in center, shows eagle perched on American shield. Scroll in its beak contains motto "State Sovereignty—National Union."

16. **Indiana.** Adopted May 31, 1917. Height 4 feet 4 inches, length 5 feet 6 inches. The 13 stars around torch represent 13 original states. Inner half-circle of five stars represents five states admitted to Union before Indiana, and large star above torch represents Indiana.

17. **Iowa.** Adopted March 29, 1921. Pennant in eagle's beak reads "Our Liberties We Prize and Our Rights We Will Maintain." Red, white, and blue stripes refer to time when Iowa, as part of Louisiana Purchase, was under French flag.

18. **Kansas.** Adopted March 23, 1927. Height 3.6 feet, length 5.65 feet. In state seal agriculture is represented by plowman, commerce by river and steamboat, early history by herd of buffalo fleeing from two Indians on horseback and by west-bound prairie schooners. Motto reads "Ad Astra per Aspera" (To the stars through difficulties). Above seal is state military crest, sunflower on bar of gold and blue.

19. **Kentucky.** Approved March 26, 1918. State seal, encircled by wreath of golden rod, shows two men shaking hands while streamer above them bears legend "United We Stand, Divided We Fall."

20. **Louisiana.** Adopted July 1, 1912, but first flown about time of War of 1812. State seal in center shows white pelican feeding young. On white ribbon below is state motto "Union, Justice & Confidence."

21. **Maine.** Adopted Feb. 24, 1909. Height 4 feet 4 inches, length 5 feet 6 inches. In center is state coat-of-arms, adopted Jan. 9, 1820, showing pine tree, moose lying at foot of it, farmer resting on scythe, and sailor resting on anchor. In crest is North Star, and motto over shield is "Dirigo" (I lead).

22. **The Stars and Stripes.** How did the design of the American flag originate? Strange as it may seem, no one really knows. We do know that, in May 1777, Congress appointed George Washington, Robert Morris, and Col. George Ross to plan a flag; that on June 14, 1777, Congress authorized a certain design (see 157), and that the business of making flags continued in the hands of Mrs. Betsy Griscom Ross and later her daughter, Mrs. Clarissa Wilson, until 1857. Whether Betsy Ross suggested the design

approved by Congress is not known, but 13 stripes appeared in the flag of the Philadelphia Light Horse troop (see 172), in the Bennington flag (159), and in the first navy ensign (158), all made before the flag committee of 1777 began its work. Who suggested these stripes in the earlier flags? No one knows. The coat-of-arms of the Washington family not only has three stars and two stripes in juxtaposition, but its crest contains a raven with wings outspread, like the spread eagle of the United States coat-of-arms (see 33). The old Roman Republic, and the Etruscans before them, also used an eagle perched on a staff. We need not look so far afield for our eagle, however. When John and Sebastian Cabot landed in North America, the Indians met them with the first American flag, the wing feathers of an eagle, bound to the top of a pole. The American flag as accepted in 1777 had 13 stripes, but in 1794 it was given 15 stripes because of the admission of Vermont and Kentucky to the Union, and by 1814 it had acquired 18 stripes. The difficulty was not settled until July 4, 1818, when the 13 stripes were restored. Many interesting details of the growth of the American flag are contained in the accounts of various American flags beginning with No. 157. When the eagle appears on the staff, with tassels, the flag is wrapped about the pole, not flown with a cord. The proper legal dimensions of the United States flag were prescribed by executive order of President Taft, Oct. 29, 1912, as follows: Hoist (height) of flag, 1. Fly (length) of flag, 1.9. Hoist of union (blue field), $\frac{1}{3}$. Fly of union, 0.76. Width of each stripe, $\frac{1}{3}$. Diameter of each star, .0616.

23. Maryland. Adopted March 9, 1904, but used from the founding of the colony. It represents escutcheon of Lord Baltimore's paternal coat-of-arms. This flag was carried February 1638, when William Claiborne's settlement on Kent Island was taken; and in 1655 at battle of Severn Governor Stone's forces carried it when they marched against the rebellious "Puritans of Providence."

24. Massachusetts. Adopted 1908, revised March 6, 1915. State seal in center shows blue shield with Indian holding bow in right hand and arrow in left hand, and a 5-pointed silver star above his right arm. Above shield is an arm bent at elbow, the hand grasping a broadsword, and on scroll the motto "Ense petit placidam sub libertate quietem." The motto was adopted in 1775 by the provincial congress during the Revolution, and was intended to convey to England this message: "By the sword this hand seeks peace, but peace only under liberty." Other side of flag shows green pine tree on blue shield.

25. Michigan. Adopted Aug. 1, 1911. In center is state coat-of-arms with word "Tuebor" (I will defend). On lower part of shield is a rising sun, and man in rustic clothes standing on peninsula, his right arm raised and left resting on a gun stock. Scroll below motto reads "Si quaeris peninsulam amoenam circumspice" (If you seek a beautiful peninsula, look about you). Shield is supported by an elk and a moose and surmounted by an American eagle.

26. Minnesota. Adopted Feb. 28, 1893. State seal in center has wreath of white moccasin flowers. Red ribbon bears motto "L'Étoile du Nord" (Star of the North). Seal bears dates 1819, date of settlement; 1858, date of admission to Union; and 1893, date of adoption of flag. The 19 stars surround seal because Minnesota was 19th state admitted to Union after the original 13. Large star at top typifies Minnesota as North Star state. Seal represents pushing out of civilization against the barbarians. A white man is plowing, with his gun on a stump, while an Indian moves toward the setting sun. Flag standard is surmounted by gold gopher and has gold cord and tassel.

27. Mississippi. Adopted Feb. 7, 1894. Square canton at upper left represents old Confederate battle flag (see 190). Staff is surmounted with battle-ax.

28. Missouri. Adopted March 22, 1913. Height seven-twelfths of length. State coat-of-arms in center, adopted Jan. 11, 1822, is surrounded by circle of 24 stars representing Missouri as 24th state of Union.

29. Montana. Adopted Feb. 27, 1905. State seal in center, approved March 2, 1893, shows brilliant sun setting

behind mountains; in foreground are a plow, a miner's pick and shovel, and the Great Falls of the Missouri. Scroll below reads "Oro y Plata" (Gold and Silver). Gold fringe along upper and lower edges of flag.

30. Nebraska. Adopted March 28, 1925. Center is state seal adopted June 15, 1867, with steamboat ascending Missouri River; blacksmith with hammer and anvil, representing mechanical arts; settler's cabin and sheaves of wheat, for agriculture; and train of cars heading toward Rocky Mountains. Motto at top reads "Equality before the law."

31. Nevada. Adopted March 26, 1929. Two sprays at upper left are sagebrush. Yellow scroll reads "Battle Born."

32. New Hampshire. Adopted Feb. 24, 1909. State seal in center showing ship is surrounded by inscription "Sigillum Republicae Neo Hantoniensis, 1784" (Seal of the Commonwealth of New Hampshire).

33. Great Seal of the United States. Adopted by Continental Congress June 20, 1782. The red, white, and blue of the American flag signify red for valor, white for purity, blue for perseverance and justice. Olive branch and arrows refer to power of peace and war which rests exclusively in Congress. Group of 13 stars represents formation of a new nation. The American eagle bears the shield on its breast without any other support, meaning that the United States ought to rely on their own virtues. In right talon eagle holds olive branch of 13 leaves and berries, in left a bundle of 13 arrows, and in his beak a scroll reading "E Pluribus Unum" (Out of Many, One).

34. New Jersey. Adopted March 26, 1896. Flag buff because in 1779, by authorization of Congress, Washington selected blue and buff uniforms for regiments of New Jersey Continental line. Washington is said to have chosen buff facings for troops of New York and New Jersey because these colonies were originally settled by Dutch, and Jersey blue and buff were part of Netherlands insignia. Legend below coat-of-arms reads "Liberty and Prosperity."

35. New Mexico. Adopted March 19, 1925. Height is two-thirds of length. In center is symbol for the sun used by Zia Indian Pueblo, to represent New Mexico's sunshine, and to acknowledge the aid Indians gave the settlers by their knowledge of irrigation. The red and yellow are colors of Spain, which once ruled New Mexico.

36. New York. Adopted April 8, 1896, color of field changed from buff to blue in 1901. State coat-of-arms in center, which dates from March 16, 1778, has sun rising behind range of three mountains. In foreground are ship and sloop on Hudson; above, American eagle and globe. At left of shield is blue-robed figure of Liberty with coronet of pearls; her right hand holds staff crowned with liberty cap of gold; her left foot rests on royal crown, symbol of emancipation from monarchy. To right of shield is golden-robed Justice, eyes bound, scales in left hand. A gold eagle surmounts staff.

37. North Carolina. Adopted March 9, 1885. Blue union equals red bar in length. Date on scroll, May 20, 1775, is based on the Mecklenburg Declaration—a series of resolutions that some think to be the earliest assertion of independence from Great Britain made in the colonies. Other date, April 12, 1776, is date when North Carolina, first of all the colonies, directed its delegates in Continental Congress at Philadelphia to vote for independence.

38. North Dakota. Adopted March 3, 1911. Design based on regimental colors of First North Dakota Infantry in Spanish-American War and Philippine Insurrection, except for words "North Dakota" on scroll.

39. Ohio. Adopted May 9, 1902. Only state flag in pennant shape. The triangles formed by main lines of flag represent hills and valleys; the stripes, roads and waterways. The 13 stars grouped about circle represent 13 original states. Circle represents the Northwest Territory, and additional four stars indicate Ohio was 17th state in Union. White circle represents initial letter of Ohio and suggests name "Buckeye State."

40. Oklahoma. Adopted April 2, 1925. Indian shield in center has fringe of seven eagle feathers, and is crossed by olive branch and calumet, or peace pipe.

41. Oregon. Adopted Feb. 26, 1925. Height 4 feet 4 inches, length 5 feet 6 inches. Yellow fringe four inches deep; cord and tassel, blue and white silk intermixed. State coat-of-arms in center shows wagon, Pacific Ocean, British man-of-war departing, and American steamer arriving. Below words "The Union" are a sheaf, a plow, and a pickax. Date 1859 indicates Oregon's admission to Union; 33 stars refer to number of states at that time. Reverse blue, with golden beaver in center.

42. Pennsylvania. Adopted June 13, 1907. Height 4 feet 6 inches, length 6 feet 2 inches. Yellow silk fringe two and one-half inches wide, blue and white tasseled cord. State coat-of-arms in center shows ship sailing ocean, plow, sheaves of wheat, and harnessed horses. Below eagle is motto "Virtue, Liberty and Independence."

43. Rhode Island. Adopted May 19, 1897. Height 4 feet 4 inches, length 5 feet 6 inches. The 13 gold stars represent original states; the anchor and word "Hope" marked Rhode Island's colonial flag (see 176).

44. Philippine Islands (coat-of-arms). Adopted 1905. Revised in 1936 to make upper part of shield white with three gold stars, lower part blue at left and red at right. Center design has Spanish fortress above on red ground, and sea lion below on white ground. White scroll below bears the words "Commonwealth of the Philippines" in gold letters.

45. South Carolina. Adopted Jan. 28, 1861, when South Carolina declared itself independent; when it later entered the Confederate Union, the blue flag of the white palmetto and crescent became the state flag, and has since so remained.

46. South Dakota. Adopted March 8, 1909. Length two-thirds greater than height. Golden sun in center is two-fifths of height. Other side has state seal showing river with steamboat, farmer with plow, herd of cattle, field of corn, smelting furnace, range of hills, and motto "Under God the people rule."

47. Tennessee. Adopted April 17, 1905. Length is five-thirds of height. The three stars in blue disk indicate Tennessee was third state to join Union after original 13.

48. Texas. Adopted Jan. 25, 1839, to replace the first Texas national flag of azure with central gold star.

49. Utah. Adopted March 9, 1911, central design revised March 11, 1913. On shield below eagle is beehive in clump of sego lilies, above which is word "Industry." Date 1847 is that of founding of state by Mormons, who formed an independent government and called it "State of Deseret" (Deseret meaning "the land of the honeybee"). Below draped flags is date 1896, the year of admission to Union.

50. Vermont. Adopted March 26, 1923. In center is state coat-of-arms, which shows landscape with high mountains, pine tree, three sheaves, and red cow.

51. Virginia. Adopted April 30, 1861. Height 16 feet, length 20 feet. In center is state seal, adopted July 5, 1776, showing Virtus, genius of the Commonwealth, dressed like Amazon, spear in one hand and sword in other, trampling on prostrate Tyranny, whose crown has fallen off, and who holds a broken chain in one hand and scourge in other. Above Virtus appear words "Sic Semper Tyrannis" (Thus Ever to Tyrants).

52. Washington. Adopted Jan. 2, 1926. In center is state seal in gold. Date 1889 at base of portrait is that of admission to Union. Gold fringe optional.

53. West Virginia. Adopted Feb. 24, 1905. Proportions, 9 units high to 13 long. In center is state coat-of-arms adopted Sept. 26, 1863, showing rock covered with ivy, inscribed "June 20, 1863," date of state's foundation. Farmer in hunting clothes supports woodman's ax with left hand and rests his right on plow handle, indicating that state was partly cultivated and partly being cleared of original forests. Other figure is a miner with pickax on shoulder and lumps of mineral at his feet. At his left are anvil and sledge hammer, typical of mechanical arts. Two crossed rifles and liberty cap in foreground indicate freedom was won and will be defended by arms. Reverse shows sprig of rhododendron, the state flower.

54. Wisconsin. Adopted April 26, 1913. Height 4 feet 4 inches, length 5 feet 6 inches. Yellow silk fringe 2½ inches wide, and blue and white tasseled cord. State coat-of-arms in center shows plow, crossed shovel and pick, arm and hammer, and anchor. Shield is supported by sailor holding coil of rope and laborer holding pick. Above is badger and motto "Forward."

55. Mindanao and Sulu (coat-of-arms). Adopted in 1905. Upon escutcheon of United States is imposed a Moro war canoe. Replaced by new Philippine coat-of-arms (see 44).

56. Wyoming. Adopted Jan. 31, 1917, and Feb. 14, 1927. Height is seven-tenths of length, red border one-twentieth of length, and inner stripe of white one-thirtieth of length. Length of buffalo is one-half that of blue field. On buffalo's ribs appears great seal of state in blue. Diameter of seal is one-fifth flag's length.

57. Alaska. Adopted May 2, 1927. Selected from 142 designs made by school children of territory in contest conducted by American Legion. Designer was Bennie Benson, 13-year-old pupil in 7th grade of Mission Territorial School near Seward. The blue typifies the evening sky, the sea, the mountain lakes, and the wild flowers. The eight gold stars represent wealth hidden in Alaskan gold mines. Seven stars form the "Big Dipper"; the eighth is Polaris, the North Star, which has guided many a "sourdough" in Alaska.

58. Coast Guard. Adopted Aug. 1, 1799, for Revenue Cutter Service, now merged with Life Saving Service in Coast Guard. The 16 vertical stripes represent the 16 states of 1799. The Customs flag is the same except that on seventh red stripe of Coast Guard flag appears Coast Guard emblem with the motto "Semper Paratus" (Always Prepared). This is the oldest unchanged flag in the United States.

59. Secretary of Navy. Adopted in 1866, abolished Jan. 1, 1870, restored Jan. 6, 1876.

60. United States Air Mail. Adopted Sept. 1, 1930, for display on buildings at airports handling air mail.

61. United States Immigration Service. Adopted May 1913. Central design is seal of Department of Labor.

62. Secretary of War. Adopted March 3, 1897. Used when secretary is ranking official in presence of troops. Same design without stars and with additional lettered ribbon below device is also used by Coast Artillery Corps, Engineers, Field Artillery, and Signal Corps. The Cavalry standard has same device on yellow field, and the Infantry on blue field.

63. United States Public Health Service. Adopted 1894. International yellow quarantine flag with service insignia in blue. Fouled anchor refers to original function of service in providing medical care for merchant seamen in distress or ill; caduceus (wand) is symbol of medicine representing the herald, or physician.

64. Marine Corps (regimental standard). Adopted Jan. 10, 1917. The colors of the Corps, kept at headquarters in Washington, bear legend "Semper Fidelis" (Always Faithful). Design shows map of western hemisphere imposed upon anchor. The Marine Corps has, of course, had other flags during its long history. Dimensions of standard shown are 4 feet 4 inches high, 5 feet 6 inches wide. This flag is carried with regiment on all occasions except drill.

65. Consular Flag. Adopted April 27, 1903. Use is decreasing, but flag is still flown from small boats in harbors when consular officers are aboard.

66. Porto Rico (coat-of-arms). Adopted March 9, 1905. Design is restoration of original arms of the Spanish Colony of "the rich port." Silver lamb on red book, bearing cross-crowned banner of Christ, is device ascribed to St. John. Gold-crowned "F" and "I" stand for Ferdinand and Isabella. In border are castles of Castile. Crowned red lions proclaim Leon. Crosses stand for Jerusalem, and small flags are standards of Spain in the days of her glory.

67. Coast and Geodetic Survey. Adopted Jan. 16, 1899. Red equilateral triangle represents work of surveying in United States waters, the bureau's chief activity.

68. Bureau of Fisheries. Adopted July 1, 1897, when bureau was an independent commission.

Flags That Wave in Foreign Lands

69. Red Cross. Adopted Oct. 29, 1863, at Geneva conference, when 14 countries decided on a flag with red cross on white background, reverse of Swiss flag (see 137). Design suggested by now unknown Frenchwoman in honor of Switzerland and two Swiss, Henri Dunant and Gustave Moynier, active in peace work. First society to use symbol of Red Cross in United States organized July 20, 1866. Sanitary services of all but two modern armies use Red Cross; Persia uses red lion and red sun on white field, and Turkey uses red crescent on white field.

70. Abyssinia (Ethiopia). This was the banner of the country which was conquered and absorbed by Italy in 1936.

71. Afghanistan. Adopted 1930, by Nadir Shah, the last of three flags which flew over Afghanistan in 1930. Ancient flag was all black, with white design in center. Early in 1930 Amanullah Khan, then ruler, changed flag to red, black, and white stripes, with new white design in center. Soon afterward he was deposed. When Nadir Shah rescued country from disorder, he again changed flag, giving it black stripe for the past, red stripe for the blood shed for independence, green stripe for hope for the future and also for traditional color of Mohammedans.

72. Albania. Adopted Nov. 27, 1912. In 1930 helmet of Scanderbeg was placed above eagle on flag. Design almost same as flag of Scanderbeg, an Albanian hero, whose real name was George Castriota (1403-1468). As boy of 11 he was held as hostage by Turks, who named him Iskander (Alexander) Bey, corrupted to Skanderbeg, or Scanderbeg. He fought to free Albania, was given aid by the pope, who in 1448 sent him a gilt bronze helmet, which is now in a museum at Vienna. Though Albania was conquered and absorbed by Italy in 1939, it was allowed to retain its flag.

73. Argentina. Adopted July 9, 1816; designed 1812. Flag General San Martin carried north into Peru with liberating army. Argentina added golden sun.

74. Australia. Adopted Oct. 3, 1908. The five small stars represent Southern Cross, always visible in Australia; seven-pointed star stands for seven states and territories.

75. Austria. Adopted Oct. 21, 1921. Design dates to battle in 1193 against Saracens, when Duke Leopold II of Austria and his brother lost all their banners. Leopold grasped his white scarf by center, dipped ends in blood, and thus produced three stripes. Replaced by German flag, 1938.

76. Belgium. Adopted Jan. 23, 1831. Colors said to represent provinces in Confederation of Belgian States in 1790 revolution. Black stands for force, red for victory, yellow for maturity. These are also colors of Duchy of Brabant, leader in 1830 revolt against Dutch rule.

77. Bolivia. Red denotes animal kingdom; gold, mineral kingdom; green, vegetable kingdom. Bolivian coat-of-arms in center shows top of Mount Potosi, rich in minerals; an alpaca; a sheaf of wheat; and a breadfruit tree. Above mountains is rising sun. On each side of oval are three Bolivian flags, a cannon, and two rifles with fixed bayonets. On right is an Inca battle-ax, on left a liberty cap. Above is condor of Andes, bearing laurel and olive branches.

78. Brazil. Adopted Nov. 19, 1889. Resembles old flag of Empire of Brazil (see 201). Green field, twice as long as wide, represents vegetable kingdom; yellow diamond, mineral kingdom. Blue circle shows heavens at Rio de Janeiro with Southern Cross at meridian. Legend means "Order and Progress."

79. Bulgaria. Adopted 1879. White stripe stands for peace, green for forests, red for blood shed for freedom. Golden lion of Bulgarian arms stands in corner.

80. Canada. Coat-of-arms, adopted Nov. 21, 1921, appears in red fly of merchant flag and on blue of navy ensign. It includes the arms of England, Scotland, Ireland, and France, with spray of maple leaves on silver field at base.

81. Chile. Adopted Oct. 18, 1817, by Gen. Bernardo O'Higgins, liberator and dictator of Chile, who chose colors from United States flag, and added silver star used on pennants of Indian tribes in Chile.

82. China. Adopted 1928. Flag of Nationalist party, or Kuomintang; white sun in blue field in upper left corner of red flag; red for revolution, blue and white for peace.

83. Colombia. Designed 1832 for Republic of New Granada, which then included Colombia and Panama. Red and yellow represent colors of Spain, also mineral wealth and blood of patriots; blue represents ocean waters on either side of Isthmus of Panama, also the Atlantic, separating Colombia from Spain. Shield shows pomegranate, cornucopia of gold coins and one of fruits, red liberty cap on lance, two ships on either side of isthmus, condor of Andes, and legend "Libertad y Orden" (Liberty and Order). Colors taken from original flag of Simon Bolivar (see 199).

84. Costa Rica. This country, with the rest of present-day Central America, declared independence from Spain Sept. 15, 1821. In 1823 they formed a Central American Federation, whose flag was blue, white, and blue, with coat-of-arms in center. All five nations of Central America today use some modification of this flag, Costa Rica being the only one to add red stripe. (See flags of Guatemala, Honduras, El Salvador, and Nicaragua.)

85. Cuba. Adopted Jan. 6, 1906. First used by Gen. Narciso Lopez when he landed at Cardenas May 19, 1850, in unsuccessful attempt to free Cuba. Flown in revolutions of 1868 and 1895, and during American occupation. Known to Cubans as "La Estrella Solitaria" (The Lone Star). Star borrowed from the old Texas flag (see 188); equilateral triangle is Masonic symbol of liberty, fraternity, and equality.

86. Czechoslovakia. Adopted March 30, 1920. Blue triangle represents Slovak mountains; white and red the historic banner of ancient Bohemia. Replaced by flag of Germany, which absorbed Czechoslovakia in 1939.

87. Danzig. Adopted March 18, 1920; details prescribed March 18, 1922. It is the old flag of the Hanseatic League.

88. Denmark. One of the oldest of flags. Legend says on June 15, 1219, during battle of Reval, the hard-pressed Danish king, Waldemar II, saw this cross in heavens and thus acquired strength to defeat the Estonians. Another account says cross fell from the heavens before Waldemar.

89. Ecuador. Adopted Oct. 31, 1900. Taken from old Venezuelan flag of July 5, 1811, or flag of Simon Bolivar (see 199). Arms in center show sun rising over Mount Chimborazo, river with steamship, and condor.

90. Egypt. Adopted Dec. 10, 1923. Tradition dates it from 626 A.D., when Mohammed unfurled his green turban as flag. Arabia, Egypt, and Turkey were then politically united. The actual turban was kept in Cairo until 1215, and is now in Constantinople. Sentiment has suggested white stands for peace, green both for the prophet and the spring green of Nile's banks, three stars for Turks, Arabs, and Egyptians, and moon for lunar calendar. For years flag of Egypt was red, with star and moon design.

91. Estonia. Adopted Feb. 24, 1918. Origin and meaning obscure. Blue and white may come from flag of Finland. Replaced by Soviet Russian flag in 1940.

92. Finland. Adopted May 29, 1918. Cross from Swedish flag, shield from arms of Russia; nine white roses back of lion on shield represent nine provinces of Finland. Lion brandishes straight sword, used in west, and treads underfoot curved scimitar of Orient, to indicate that Finland rejected the Orient and held to European traditions.

93. France. Many stories are told of the origin of the tricolor, which dates from 1789. One says after taking of Bastille, Lafayette devised new cockade from white of royal family and red and blue colors of Paris. Another version declares tricolor represents the three historic flags of France—blue of Chape de Martin (cloak of St. Martin), red of oriflamme, and white of Bourbons. Chape de Martin, supposed to be the original cloak St. Martin divided with a beggar at Amiens, was in keeping of monks of Marmoutier. Clovis carried it when he conquered Alaric; Charlemagne carried it at Narbonne. When seat of French government was removed to Paris, blue flag of St. Martin was supplanted

by scarlet oriflamme of the Parisian St. Denis. White flag of Bourbons originated with Huguenots and became royal ensign when Henry III came to throne. Henry IV, first of the Bourbon kings, made it a national flag. A third account says tricolor is copied from shield of Orleans family as it appeared after Philippe Égalité removed fleur-de-lys.

94. Germany. National flag of the German Reich, decreed by law of Sept. 15, 1935. It has a red field with a black swastika in a round white center. From March 12, 1933, to Sept. 15, 1935, the national colors consisted of the swastika flag flown side by side with the old black, white, and red imperial flag.

95. Great Britain. The red cross of St. George on white field was first flag of England. Legend says badge originated when St. George rescued a princess from a dragon, dipped his lance in the dragon's blood, and traced a cross on his white shield. At siege of Antioch, 1098, when Crusaders were losing, St. George with his flag and a host of heavenly soldiers were seen in sky by Bishop of Le Puy, and the apparition saved the day. Richard Coeur de Lion brought the story back to England, proclaimed April 23 as St. George's Day, and made his banner the flag of England. In 1606, three years after James VI of Scotland became also king of England, the Scottish emblem, the cross of St. Andrew, was added. According to tradition, when St. Andrew, one of the Twelve Apostles, was crucified he asked to die on a cross shaped like the letter "X," because he said it would be presumptuous to be crucified on the same kind of cross as was Christ. This diagonal white cross was seen in blue sky during a battle in 940 between Scots and Saxons, and Scotland took a white cross on a blue field for banner. Thus the English flag got its blue field and white diagonals. The Cross of St. Patrick was added in 1801, after Ireland had been included in the United Kingdom. St. Patrick's cross is two red diagonals on a white field. Authorities on heraldry hold that this badge did not originate with St. Patrick but with the Norman house of Gerald who entered Ireland in 1169.

96. Greece. Adopted Jan. 1, 1822, at beginning of revolution which ended Turkish rule. Revolts had been attempted from 1750 onward. Chryso, daughter of an early revolutionist, made the first flag for Greek patriots. It took her six years to embroider a white Greek cross on a plain blue field. She presented it to soldiers assembled at monastery of St. Laura in the Peloponnesus, where monks still preserve it. It was carried during the Greek War of Independence. Then the Greeks placed the design of Chryso's flag in upper left corner of national flag, and put four white bands across blue field for four countries which helped them—England, Russia, France, and United States. That is one story. Others say stripes stand for nine stripes on gold shield of Achilles, or for nine muses, or that they represent the nine syllables in the Greek words for "Liberty or Death."

97. Guatemala. Adopted Aug. 17, 1871, restoring colors of Aug. 21, 1823. Scroll on coat-of-arms reads "Libertad, 15 de Setiembre, 1821" (Liberty, 15th of September, 1821). Above is a quetzal, national bird of Guatemala (see 205).

98. Honduras. Adopted Feb. 16, 1866. Flag of old Central American Federation, with five stars added.

99. Hungary. Ten centuries of Hungarian history are told in elaborate coat-of-arms. Above is crown of St. Stephen, one of Hungary's greatest rulers, who fought to establish Christianity and subdue pagan nobles. So wise was his rule that Hungarians still call their country "the land of St. Stephen." In the year 1000 the pope sent him this famous crown and the double-barred cross in right half of shield. Many legends tell how cross on crown came to be tilted. One says St. Stephen fell and crown struck a rock; another that one of two rivals to throne buried the crown, and bent cross when he dug it up. Still another tells that Louis Kossuth buried it in 1848 so it would not be used to crown the Austrian emperor; four years later a friend of Kossuth went to get it, was trapped by Viennese police, and they bent the cross. One interesting tale relates that crown of St. Stephen was placed on head of baby king, four months old; revolution broke out, and mother and baby fled, with crown tucked

upside down in quilts on baby's lap and a spoon in it to make it look like a saucepan. Today crown of St. Stephen is in Queen Elizabeth Museum in Budapest. The three mountains in right side of shield are said to represent three ranges in the Carpathians—Tatra, Fatra, and Matra. At left, four white stripes on red are said to mean four rivers of Hungary. But red and white stripes are often seen in heraldry, and historians suggest that perhaps they represent a knight's armor, red with his blood, except for bands protected by horizontal stripes.

100. Iceland. Authorized June 19, 1915, by King of Denmark. Resembles flags of Denmark, Finland, Sweden, and Norway. Ratio of height to breadth is 18 to 25; width of bars forming white cross should be two-ninths height of flag.

101. India. Indian ships fly blue ensign of Great Britain with star of India in the fly. About star in small letters appear words "Heaven's Light Our Guide."

102. Ireland. Adopted 1922, but in use since 1916. Orange, for Unionist party, is the color of the old Orangemen, loyal to William of Orange when Irish revolted. Green, for Nationalist party, is the old color of the Irish clans.

103. Italy. Red, white, and green flag first flew at Modena in 1797, as banner of Cispadane Republic, formed by Napoleon in 1796. In 1805, when Napoleon grouped north Italian provinces into a kingdom, he adopted this flag. It appeared again in 1848, when King Carlo Alberto of Piedmont (of House of Savoy) attempted to free Italy. He added to tricolor the arms of House of Savoy. Garibaldi carried this flag in 1870, when Italy was liberated. King Victor Emmanuel II adopted it with crown over arms of Savoy. Design was given Duke of Savoy in 1300 when he helped Knights Hospitalers of St. John defend Island of Rhodes against Saracens. Their badge was white cross on red field (see 156).

104. Japan. National flag with round red sun dates formally to a few years before the reign of Meiji Tenno (Mutsuhito). There is no authentic account of flag's origin. The naval flag is the "rising sun," a red ball on white ground with 16 red rays to edges of the flag; imperial standard, conventionalized gold chrysanthemum on red ground.

105. Yugoslavia (Yugoslavia). Proclaimed 1921 by Constitutional Assembly, although in use before. First Serbian flag, designed late in 18th century by Zachary Orphelin, had horizontal red, blue, and white stripes. When Serbs gained independence from Turkey in 1878 they flew this flag. But it was like that of Montenegro, so stripes were rearranged. Bosnia, Croatia, and Slovenia all had flags of various arrangements of red, white, and blue, but accepted this new flag for the new nation.

106. Latvia. Adopted June 25, 1921. Letts say theirs is oldest existing flag in world, for primitive tribes which settled in Latvia in 6th century carried battle flag made of an ox-hide dyed dark red with ox blood and striped down center with white chalk. Replaced by Soviet Russian flag in 1940.

107. Liberia. Adopted 1847, when Negro colonists from United States established Republic of Liberia. Similarity to American flag is obvious.

108. Liechtenstein. This tiny nation of 65 square miles is only country with flag exactly square. Reigning house dates to year 1100.

109. Lithuania. Adopted December 1918; established by constitution in 1920. Red stripe probably taken from old crimson banner of Lithuania, with white knight galloping across it. Yellow and green suggest colors of Memel (Klaipėda), Baltic port which Lithuania held from 1924 to 1939.

110. Luxemburg. The Congress of Vienna, in 1815, assigned Luxemburg and Belgium to the King of the Netherlands. In the revolution of 1830 Luxemburg was divided between Belgium and the Netherlands, although the Netherlands did not enforce the division until 1839. In 1890, when Queen Wilhelmina ascended the Dutch throne, Luxemburg passed to a collateral branch, the Dukes of Nassau. But the Netherlands was so long associated with the rule of Luxemburg that Luxemburg adopted no separate flag, even when the tie of a common ruler was dissolved.

111. **Malay States, Federated.** Stripes combine colors of four federated states, Perak, Selangor, Negri-Sembilan, and Pahang. In oval is running tiger, terror of Malay Peninsula, which no Malay mentions except as "Lord Tiger."

112. **League of Nations.** Never adopted by League as a whole but is only flag used in connection with League, and it has been adopted by International Federation of League of Nations Societies and by English League of Nations Union. Oval of white stars shows one for each member of League, and world map refers to League's world-wide activities.

113. **Mexico.** Adopted January 1917. Green means independence; white, purity of religion; red, union of Spanish and Mexican blood. Coat-of-arms refers to old legend of founding of Mexico City, formerly Tenochtitlán, that migrating Aztecs in 1325 came to lake in valley of Mexico, or Anahuac. There, as foretold, they saw perched on a prickly pear a huge, beautiful eagle, with wings outspread, clutching a serpent. Eagle was drawn for coat-of-arms in 1821, flag with this design was adopted in 1823, then redrawn in 1917 in more realistic way, with added words "Estados Unidos Mexicanos" (United States of Mexico). New design conforms to old Aztec pictographs of legend. (See also 19S.)

114. **Monaco.** A tiny nation of about 370 acres displays this simple flag. Occasionally staff is painted with red and white spiral, like a barber pole.

115. **Nejd (Saudi Arabia).** Christian eyes rarely see this flag of Nejd, which has been adopted for new Kingdom of Saudi Arabia. Green is old Mohammedan green of prophet's turban (see 90), and Arabic inscription "La ilahu illa-llahu" is old Mohammedan battle cry "There is no God but Allah." Arabs for many years flew a banner of plain crimson.

116. **Nepal.** Strangest of flags is the dove-tailed banner of Nepal, with two "pie-faces" of sun and crescent moon, symbols which signify nation shall be as everlasting as the sun and the moon. Expansion of crescent moon represents growth of glory and fame.

117. **Netherlands.** Orange, white, and blue, colors of William of Orange, Dutch hero, served as Dutch flag for years (see 193 and 195). Orange, because hard to see at a distance, was changed to red in 17th century.

118. **New Zealand.** Southern Cross of Australia's flag is seen again on New Zealand flag.

119. **Nicaragua.** Adopted Sept. 4, 1908, but design dates to flag of Central American Federation of 1823. Coat-of-arms shows five volcanoes for five nations of Nicaragua, Guatemala, Honduras, Costa Rica, and El Salvador, with a red liberty cap on a lance above the mountains and rainbow in sky. (See 84.)

120. **Norway.** Adopted 1821. Norway was for many years united with Denmark. When Napoleonic wars ended and Norway was given to Sweden, Norway had no flag, and its sailors, not wishing to sail under Swedish flag, took their old Danish flag and added a blue cross, probably from cross on Swedish flag.

121. **Palestine.** British flag is official flag of Palestine, now under British protection, but Zionists use blue and white flag with six-pointed star formed of two crossed triangles. This star is referred to in Hebrew literature as Magen David, or Shield of David. A similar design is called Solomon's Seal. The two triangles are said to refer to union of soul and body. Star used as Jewish symbol for at least 2,000 years. Blue color refers to Chair of Glory, "Under His feet . . . a sapphire stone" (Ex. xxiv, 10). Is also color used in tzitzit, a ceremonial garment dyed in ancient times with blood of halzun (snail) which appeared but once in 70 years. Stripes taken from stripes of Jewish tallith (prayer shawl). This flag has been used since 1898, when it was flown at Second Basel Congress. Never officially adopted, but generally accepted and now widely used.

122. **Panama.** Adopted June 4, 1904. Red and blue represent two political parties; two stars said to stand for Panama and Colon, cities at two ends of Panama Canal.

123. **Paraguay.** Adopted Nov. 27, 1842. Original Paraguay flag was blue, flesh-color, and yellow. The dictator

José Gaspar Rodríguez Francia, 1814-1840, a great admirer of Napoleon, changed to colors of France. National shield in white stripe shows five-pointed red star and wreath of palm and olive branches. On reverse of flag is circle with lion seated at foot of pike bearing liberty cap, and the motto "Paz y Justicia" (Peace and Justice).

124. **Persia (Iran).** Adopted 1907. Design is very old. Lion is symbol of Babylon, sword represents a conquered province, and sun has been since prehistoric times a symbol of Persia, where even today people salute it each morning with a grave bow. Babylon appears in Persian history when Cyrus the Great diverted waters of the river Euphrates and captured Babylon, surprising Belshazzar and his guests at a banquet after they had disregarded warning of Daniel. Green stripe stands for Mohammedanism, white for peace, red for valor.

125. **Peru.** Adopted Feb. 25, 1825. Coat-of-arms in center shows llama on blue field, cinchona tree on white field, and cornucopia pouring gold coins on red field. These symbolize riches of animal, mineral, and vegetable kingdoms.

126. **Poland.** Adopted Dec. 13, 1927, but flown since 1919. This white and red flag was made by Napoleon for Duchy of Warsaw, and was carried in various attempts to free Poland. Colors, red and white, go back to old Polish banner of Lech, a white eagle on red field. Legend says the brothers Czech and Lech set out from Yugoslavia to find a home for their people. Czech founded Prague. Lech went on, saw a white eagle in a tree, took it as an omen, and founded Warsaw. Polish flag has disappeared since 1939, when Poland was partitioned by Germany and Russia.

127. **Portugal.** In center is silver shield with five blue shields in form of cross, representing triumph of Alfonso I over five Moorish princes in battle of Ourique. Each blue shield has five silver spots, representing five wounds of Christ, in whose strength Alfonso declared he had defeated the infidels. Around shield is red border with seven golden castles, added by Alfonso III in 1252 on marrying a princess of Castile. Circle of gold with gold ribbons commemorates fame of Prince Henry the Navigator. Green of flag is that of cross and ribbon of Knights of St. Benedict of Aviz.

128. **Rumania.** In 1848 Rumanians rose against Hungary under flag of red, yellow, and blue. In 1859 Rumania was united under present flag. Red represents Muntenia, and also Wallachia's banner of red with crow. Oltenia had yellow flag with lion, and Moldavia blue flag with head of eastern buffalo.

129. **Russia (Union of Soviet Socialist Republics).** This new flag of Soviet Russia displays red of revolution, and hammer and sickle of working classes who overthrew aristocracy. Old Russian flag was of three horizontal stripes, white, blue, and red. Peter the Great admired Holland and adopted its flag, but turned it upside down so stripes would be blue, white, and red. But this topsy-turvy flag was signal of distress, he learned, so he altered order of blue and white stripes. That flag remained until the revolution.

130. **El Salvador.** Adopted May 17, 1912. Old flag of Central American Federation. Coat-of-arms is similar to that of Nicaragua. (See 119.)

131. **Santo Domingo.** Adopted 1844, when eastern Haiti established Dominican Republic. When used as ensign on man-of-war the coat-of-arms appears on center, with cross, book of Gospels, and inscription "Dios, Patria, Libertad" (God, Country, Liberty), the password of "La Trinitaria," patriotic society which inaugurated revolution.

132. **Scotland.** Rampant lion, first appearing in 1230 on seal of King Alexander II, was borne by all kings of Scotland. When James VI became king of England in 1603 lion was made part of king's standard, where it remains today.

133. **Siam (Thailand).** Siam until lately had red flag with splendid white elephant. But inept flagmakers did such a poor job of portraying the elephant, which is sacred in Siam, that the king felt the elephant would be more truly honored if its representation was left off.

134. **South Africa.** Authorized May 31, 1928. In white stripe is Union Jack, old Orange Free State flag, and old

Transvaal vierkleur ("four-color"). Orange, white, and blue stripes are those of old Dutch flag of William of Orange.

135. Spain. Adopted Feb. 2, 1938. This is the merchant flag. The national flag has a coat-of-arms upon the black eagle of St. John. At the sides are the twin Pillars of Hercules and above is a scroll bearing the words "Una, Grande, Libre" (One, Great, Free). Below are a yoke and a bundle of arrows, symbolizing discipline and unity.

136. Sweden. Early in 16th century, when Sweden was part of Denmark, King Christian II cruelly oppressed the people. Gustavus Vasa, son of Swedish noble, sent as hostage to Denmark, escaped, preached revolution, and led a small army to Falun. There he seized some Danish merchants' bales of blue and yellow silk of which Swedes made flag. After two years of fighting, Gustavus Vasa and his victorious flag entered Stockholm in 1523, and he became king. A symbol of union with Norway was removed from flag on Oct. 27, 1905.

137. Switzerland. League of three forest cantons, formed in 1291, won victory of Morgarten against Austria under a plain red flag. In June 1339, they marched to aid of town of Laupen, which was besieged by Burgundian nobles with army of 18,000 men. Swiss numbered a bare 6,000. United under a new flag, with white cross of Crusaders on old red field, they won the battle. So began struggle from which came the republic of Switzerland. In 1480, present flag with white cross was adopted by all troops of Swiss Confederate States and became the accepted national emblem.

138. Turkey. The star of Bethlehem and the moon of the moon-goddess Diana shine on the Turkish flag. In 339 B.C., Philip of Macedon, father of Alexander the Great, besieged city later called Byzantium. His men scaled the walls in the dark, and defenders, unable to distinguish friend from foe, were about to be overcome when suddenly the crescent moon appeared. By its light citizens saved city, and crescent moon of Diana became badge of Byzantium, or Constantinople. When Mohammed II of Turkey took Constantinople in

A.D. 1453, he added crescent moon to his plain red flag. When Turks saw crescent with star above it on shield of Richard Coeur de Lion they added this star to their own crescent, not realizing it was a Christian symbol, the star of Bethlehem. This flag was standardized as Turkish national flag in February 1928 by Angora government.

139. Uruguay. Adopted Dec. 16, 1928. Stripes stand for nine political departments. Sun is "El Sol de Mayo" (the Sun of May), symbolizing awakening of Uruguay, once under Brazilian domination, to a new life.

140. Vatican City. Authorized 1929, when treaty between Italy and the pope was signed. Similar to old papal flag of gold and silver. Crossed keys refer to papal power and giving of keys to Peter by Christ (Matt. xvi, 17-19). Triple crown represents papal tiara, three crowns standing for royal, imperial, and sacerdotal powers of pope, according to some authorities. First popes wore camel's-hair helmet. First crown, or circlet, mentioned in life of Paschal II, 1099-1118; second circlet added by Boniface VIII, 1294-1303; third circlet added by popes of Avignon, in 1315 or 1316. Benedict XII adopted present form in 1342. Legend on flag reads "Stato della Città del Vaticano" (State of the City of the Vatican).

141. Venezuela. First flown March 12, 1806; officially decreed July 29, 1863. Designed by Gen. Francisco de Miranda, with gold to represent golden new opportunities of America, red to represent Spain, and blue for Atlantic ocean between; seven stars are for seven original states of Venezuela.

142. Wales. Uther Pendragon, father of King Arthur, saw flaming dragon in the sky, a sign he was to ascend the throne. Thereafter he carried golden dragon to battle, which so impressed Anglo-Saxon kings they added it to their coat-of-arms. Not until reign of Edward VII was it officially restored to Welsh, the race of Uther Pendragon. It was then incorporated into arms of Prince of Wales.

Banners of the Middle Ages

[A Franciscan friar born in Spain in 1304, whose name is now unknown, compiled the first representation of the flags of all nations. He traveled as far east as Java and left a monumental work, an illuminated manuscript which he called 'Book of Knowledge of All the Kingdoms, Countries, and Lordships that there are in the World and of the Ensigns and Arms of Each Country, and Lordship; also of the Kings and Lords Who Govern Them.' This remarkable source book was recently translated into English. The quaint exactitude and broad outlook of the friar's mind are indicated in his statement of the date of his birth: 'I was born in the Kingdom of Castile, in the reign of the very noble King Don Sancho, when the era of the world, according to the Hebrews, was 5,065 years, and the era of the deluge 4,407 years, and of Nebuchadnezzar of Chaldea 2,502 years, and of Alexander the Great of Macedonia 1,617, and of Caesar, Emperor of Rome, 1,343, and of Christ 1,304 years, and of the Arabs 706, on the 11th day of the month of September.' The medieval flags pictured (143 to 156) are copied from the Franciscan work, and the following accounts of them are excerpts from the friar's manuscript.]

143. Jerusalem. "Know that in this Suria (Syria) is the city of Iherusalem (Jerusalem), which was sanctified by the holy temple of Salamon (Solomon), built there, and was consecrated by the blood of Ihesu Christo (Jesus Christ) . . . The device of this province is a white flag with red crosses." Modern authorities know these red crosses on a white shield were not the arms of Jerusalem, which are usually given as five gold crosses on a silver flag. They stand for the five wounds of Christ.

144. Naples. "The king of Naples has for his device a purple flag with gold fleurs de lys, for he is of the house of France. Above is a red slip which they call a label."

145. Granada. "The device of this king is a red flag with Arabic letters of gold, such as Mahomad, their prophet, bore."

146. China. "They call this emperor Gosman Imperator Morroy, and Grand Can, Lord of the East. His device is a gold flag and in the middle an emperor seated, in white cloths, with an imperial crown on his head, in one hand a Turkish bow, in the other a golden apple."

147. France. "Know that the kingdom of France borders on the Mediterranean, where there is a city called Narbonne, and on the Alps of Alsace and on the coasts of Flanders, and all the coasts of Gascuena (Gascony) to the Pyreneces. The king of France has three fleurs de lys of gold."

148. Germany. "I crossed a great river which they call Rinus (the Rhine), which passes by Colona (Cologne), a great city of Germany. In this city they say that the three Magian kings are interred who worshipped Jesus Christ in Belem (Bethlehem). But when I traveled the Empire of Cataya (China) I was in a city called Solin (Saba?), and they showed me three highly revered monuments, and they were in honor of the three Magian kings who adored Jesus Christ, and they said that they were natives of that city. The Emperor of Germany has for his device a flag—yellow, with a black eagle, crowned."

149. Prester John. From the middle of the 12th century to the end of the 13th, the fabulous monarch, Prester John, was believed to be a Christian king ruling a mysterious kingdom in Asia. The Franciscan friar was the first to locate him in Ethiopia. However, from the time of Virgil, Ethiopia was confused with India. Prester or Presbyter John was both priest and king, and was said to have led an army to fight for the church at Jerusalem, but was unable to pass the Tigris River. His empire was said to include the three Indies from Farther India, where St. Thomas was buried, to the sunrise, and back again to the ruins of Babylon. He marched to war with 13 great crosses of jewels and gold as his battle

standards, and in his kingdom there were no paupers, thieves, flatterers, or misers, and no quarrels or lies. Before his palace stood a miraculous mirror in which he could watch his whole kingdom. Of course, our Franciscan friar did not fail to visit Prester John, whom he found in the city of Malsa. In Malsa, the friar says, "They told me many other secrets of the stars . . . ; also concerning herbs, plants, and minerals. . . . The device of Preste Johan is a white flag with a black cross."

150. Constantinople. The friar wrote of the capital city of Byzantium: "The Emperor of Constantinople has for his device a flag quarterly, first and fourth argent a cross gules, second and third gules a cross, or (gold) between four chain links."

151. Flanders. "I departed from Cales (Calais) and went to the country of Flanders. . . . The lord of that country has a flag—gold with a black lion."

152. Rome. "The devices of Rome are a red flag with a gold bar, on which are letters." (S.P.Q.R.—Senatus Populusque Romanus, meaning the Roman Senate and People.)

153. Damascus. "Near this Damasco (Damascus) flows the river Euphrates. The king has a yellow flag with a white moon . . ."

154. Scotland. "The king of this Escocia (Scotland) has for his device a red flag with three long lions of gold."

155. Alexandria. "The king of this Alexandria has for his device a yellow flag and in the middle a black wheel in which is a lion."

156. Rhodes. This shield of the Knights of Rhodes, which the friar saw when he visited "the island of Rodas," appears in the shield of the flag of Italy (see 103). It is the emblem of the Knights of the Order of the Hospital of St. John of Jerusalem, later called the Knights of Rhodes and the Sovereign Order of the Knights of Malta. They originated in Jerusalem during the first Crusade, were expelled from the Holy Land, and set up their order again in Rhodes in 1309. They remained there until 1522. They were driven out in 1522 by Sultan Suleiman I, who lost 90,000 of his 200,000 men during the attack.

Famous Flags in American History

157. Flag of June Fourteenth, 1777. Although the design of the Stars and Stripes may have been used before its adoption by Congress on June 14, 1777, there is no official record of that time which indicates its earlier use as shown in the paintings of Trumbull and Peale. These were produced long after the events represented (such as Peale's picture of 'Washington Crossing the Delaware'), and the artists may have shown the Stars and Stripes in use on occasions which happened before the design existed. Congress did not direct a specific arrangement of the 13 stars. In the navy it became customary to place the stars so as to form the crosses of St. George and St. Andrew, as illustrated in Rhode Island's banner (see 176).

158. Cambridge Flag (First Navy Ensign). John Paul Jones hoisted this flag (also known as the "Grand Union") on Dec. 3, 1775, as the navy ensign when Commodore Esek Hopkins assumed command of the new navy. It was also hoisted by General Washington on Jan. 2, 1776, as the flag of the Continental Army and was the only national flag previous to the resolution of June 14, 1777.

159. Bennington Flag. This flag was carried at the Battle of Bennington, Aug. 16, 1777, when 2,000 Green Mountain Boys under Gen. John Stark wiped out forces of General Baum, contributing to failure of Burgoyne and thus to recognition of American independence by France. Stars are 7-pointed, a detail peculiar to this flag.

160. First Navy Jack. Hoisted Dec. 3, 1775, same day John Paul Jones hoisted No. 158 as new navy ensign.

161. Pre-Revolution Colonial. Probably flew above Mayflower in 1620 and on ships of Jamestown settlers in 1607. It is old British union flag, forerunner of present British Union Jack. Flown in the American colonies until Revolution, and appeared in upper left corner of several Revolutionary flags.

162. Culpeper. Culpeper County, Va., was a Revolutionary center and its Minute Men flew this banner. The rattlesnake device occurs on several Revolutionary flags. The rattlesnake's eye, brighter than any other animal's, and with no eyelids, is emblem of vigilance. Also, the snake never begins an attack, but once aroused it never surrenders. Probably deadly bite of rattler was also in revolutionists' minds. Snake usually portrayed with 13 rattles, symbolic of the 13 colonies.

163. Gadsden. Presented by Col. Christopher Gadsden to Commodore Esek Hopkins as commodore's flag of the new fleet. Hoisted at mainmast of the *Alfred*, Dec. 3, 1775, when John Paul Jones hoisted No. 158, and No. 160 was hoisted as a jack. Original Gadsden flag was yellow. Similar flags were made with white background, and these are often confused with Gadsden flag.

164. Colonel Moultrie. In September 1775 Col. William Moultrie was ordered to take Fort Johnson on James Island, S. C. He devised a flag suggested by blue uniforms of his men and silver crescents on their caps. Colonel Moultrie said

this was first American flag displayed in the South. Compare it with No. 45.

165. Taunton. Raised at Taunton, Mass., in 1774. It is the red union English flag of that time with the American watchword "Liberty" added.

166. Newbury, Mass. British cross of St. George is retained, with a green field to denote New England forests.

167. Fort McHenry. The flag that floated over Fort McHenry and inspired Francis Scott Key to write 'The Star Spangled Banner' had five horizontal rows of three stars each, each row staggered, and 15 stripes. In 1794 Congress had authorized that after May 1, 1795, the flag should have 15 stripes and 15 stars. The idea of adhering to 13 stripes, no matter how many states entered Union, was not accepted until 1818 (see 186). In fine weather this flag flies during daylight hours over the grave of Francis Scott Key in Mt. Olivet Cemetery, Frederick, Md.

168. Linked Hand Flag. Thirteen mailed hands grasping 13 links of an endless chain was design of an early American flag. A Newburyport company had a flag with this design, with a pine tree in center of links.

169. New England Ensign. The first distinctively American flag was this navy ensign, exactly like British red ensign, or "meteor flag of Old England," used before 1705, except for addition in upper left corner of New England pine tree, symbol of Massachusetts Bay Colony, which minted pine-tree shillings in 1652.

170. Continental, 1775-77. This flag and No. 178 are both preserved in Annapolis as reproductions of flags carried at Bunker Hill. Trumbull's painting of the battle shows No. 170. Other paintings show No. 178. Probably No. 170 was evolved from No. 169.

171. Fort Moultrie. This flag flew above Fort Moultrie (then Fort Sullivan) in Charleston Harbor during famous battle of June 28, 1776. Early in attack flag fell outside parapet. Sergt. William Jasper leaped after it under a rain of bullets, crying, "Don't let us fight without a flag." He replaced it amid cheers. After a 10-hour attack, the British forces withdrew. This victory left Southern states free from invasion for more than two years. Name of fort was changed to honor defender, Colonel Moultrie. Except for word "Liberty," this flag is identical with his.

172. Philadelphia Light Horse. Led by Capt. Abraham Markoe, a Dane, 28 men formed and equipped the Philadelphia Light Horse troop at their own expense. When Markoe resigned in 1775 because King Christian VII of Denmark forbade his subjects to fight England, he gave the troop what is said to be first American flag with 13 stripes. A knot of ribbons in center of shield has 13 flying ends. At left of shield is figure of Indian, but a Continental officer's gold crescent suspended about neck indicates it is white man masquerading as Indian, presumably in reference to Boston Tea Party of 1773. The troop carried this flag when escorting

General Washington from Philadelphia to New York on his way to Cambridge, where he took command of army.

173. Bedford. This flag, 2½ feet square, was carried by Bedford Minute Men at battle of Concord. In silver and gold, on a red ground, appear arm and sword thrust out from cloud, as in old flag of city of Ostend. Three round gray spots are cannon balls, and scroll reads "Vince aut Morire" (Conquer or Die). This flag is preserved at Bedford, Mass.

174. Andros. In 1684 England annulled charter of Massachusetts, organized all of New England as a royal domain, and on Dec. 20, 1686, appointed Edmund Andros governor. His flag was red cross of St. George on white field with gold crown and letters J. R., the monogram of King James.

175. New England, 1737. This flag differs from No. 178 only in having globe in place of pine tree.

176. Rhode Island. Carried at battle of Brandywine, at Trenton, and at Yorktown, this flag is now preserved in State House at Providence. It is made of white silk, with 13 white stars on blue field arranged to form crosses of St. George and St. Andrew. The word "Hope" is motto of state. (See 43.)

177. Liberty Tree, 1776. Massachusetts council adopted this flag in April 1776. "Liberty Tree" is found on several Revolutionary flags. Boston had a "Liberty Tree," a fine old elm in Hanover Square, under which the Sons of Liberty met just before the Boston Tea Party. For that reason, General Gage ordered it cut down. Another famous tree was a spreading live oak in Charleston near home of Christopher Gadsden. Under this oak Revolutionary leaders met to talk, and there the Declaration of Independence was first read to people of Charleston.

178. Bunker Hill. This flag was made by adding pine tree to upper left corner of old blue English ensign (see 170).

179. Washington's Cruisers, 1775. Washington's six cruisers flew this flag in 1775 before adoption of Continental ensign (see 158), and it was adopted with variations on April 29, 1776, as ensign of Massachusetts navy (see 182). This flag was flying on brig *Lady Washington* when she was captured by *H.M.S. Fowey* on Dec. 7, 1775. Her colors, placed in London Admiralty office, show a pale green pine tree on white field and motto "Appeal to Heaven."

180. Pulaski Flag. The Polish count, Pulaski, who volunteered as a private and was killed at the age of 31 while commanding French and American forces at Savannah in 1779, fought beneath this banner. His flag was embroidered by Moravian Sisters of Bethlehem, Pa. Obverse side here shown bears words "Unitas Virtus Fortior" (Union makes valor stronger). "Fortior" is an error in spelling for "Fortior." In each corner is an exploding hand grenade. Reverse side bears the motto "Non Alius Regit" (No other governs), with an all-seeing eye in center triangle.

181. New York. New York's armed ships are said to have used this flag in 1775. Beaver represents fur trade; Hudson's account of rich furs of New York led to its colonization by Holland. Beaver appeared on seal of New Netherlands, and is today on seal of New York City.

182. Massachusetts Navy. See descriptions of No. 177 and No. 179. Note coiled snake at foot of tree and familiar motto "Don't tread on me."

183. New York Regiment. This, one of few Revolutionary regimental flags now in existence, was carried at Yorktown by Col. Peter Gansevoort as colors of 3rd New York regiment. The flag, made in 1778-79, is of dark blue silk with a blue fringe, about six feet square. On each side appear arms of the state, practically unchanged today (see 36).

184. Russian-American Company, Alaska. The reign of traders' lawlessness in Alaska was checked in 1799 by formation of Russian-American Company. The company's white, blue, and red flag, with its Russian eagles, flew in the pale Alaskan sunlight from ship and trading post until 1867, when Alaska was purchased by United States (see 57).

185. Perry. At battle of Lake Erie, Sept. 10, 1813, Oliver Hazard Perry, in command of a fleet he had hastily constructed from virgin timber, unfurled this flag, which bears

dying words of Capt. James Lawrence "Don't give up the ship," in battle between *Chesapeake* and *Shannon*.

186. July 4, 1818. With adoption of this flag on July 4, 1818 (by a law passed on April 4, 1818) the Stars and Stripes began to assume their present appearance. Some favored adding a stripe for each new state (see 167), but Congress restored the 13 stripes and ordered the addition of one star for each new state, such addition to take effect the 4th day of July succeeding each admission.

187. Eutaw Standard. This brilliant crimson square flew both at Cowpens and at final battle of Revolution at Eutaw Springs in 1781, the two decisive battles of the war in the South. It was battle flag of the cavalry of Col. William Washington, a distant cousin of George Washington. It was presented to him by his fiancée, Miss Jane Elliott of South Carolina, who cut a square of gay red damask from the back of a drawing-room chair.

188. Texas Navy. When the "Lone Star Republic" was formed by the secession of Texas from Mexico, President Burnet adopted this naval flag April 9, 1836. It was approved Dec. 10, 1836, at first session of the Texas Congress. This was the first "lone-star" flag bearing governmental sanction, though earlier flags with the single star had been carried by various military organizations. One of the most famous was the flag of the Georgia Battalion which floated over the fort at Goliad when more than 300 Americans were massacred by the Mexicans. On Dec. 10, 1836, the Texas Congress also adopted a national flag for the republic which bore a central gold star in an azure field. On Jan. 25, 1839, both flags were replaced by a new national standard which later became the state flag (see 48).

189. Alamo. When Texas was fighting for independence from Mexico, this flag floated over the historic mission fortress, the Alamo, at San Antonio. For 12 days, 178 Americans held out against a bombardment by 4,000 Mexicans. The fort was taken on March 6, 1836, when only five men remained alive. These brave men Santa Anna ordered bayoneted in cold blood. "Remember the Alamo" was the cry over many a Texas battlefield. Date of 1824 on flag refers to constitution of 1824. Colors are those of Mexican flag.

190. Confederate Battle Flag, 1861. The Stars and Bars became famous as emblem of Confederacy, although during Civil War Confederates had four flags: 1. Adopted February 1861. Three bands, red, white, red, circle of seven white stars on blue canton upper left, for seven states that seceded. 2. Stars and Bars, used after battle of Manassas, in July 1861, because Union and Confederate flags were hard to distinguish. This flag, called flag of General Beauregard, was never adopted by Confederate Congress, but many Confederate soldiers never saw any other flag. 3. Adopted 1864. Pure white, with stars and bars in upper left corner. 4. Adopted March 1865. Same as No. 3 except for red bar at right end of flag, to keep it from resembling flag of truce.

191. Raven of Vikings. Five hundred years before Columbus, the Viking Eric the Red is believed to have sailed his ships to the shores of North America; thus for a brief period the Raven flag of the Vikings probably flew over American soil.

192. Columbus, Standard of Spain. The quartered flag of Castile and Leon must have been the standard planted by Christopher Columbus on Oct. 12, 1492, when he took possession of the first bit of American soil in the name of Ferdinand and Isabella.

193. Hudson, Dutch East Indies Company. When Henry Hudson sailed the *Half Moon* into New York Harbor in 1609, he flew at his masthead the flag of the Netherlands, with letters "A. O. C." on central stripe—initials of "Algemeene Oost-Indische Compagnie," the Dutch East Indies Company, which had sent Hudson to the New World. This was flag of the Colony of Manhattan until 1622. In 1650 the orange stripe was changed to red (see 117), the modern flag of the Netherlands.

194. Cabot, England. Giovanni Caboto, born, like Columbus, in Genoa, Italy, and better known as John Cabot, was sent by Henry VII of England to claim land in New World.

Cabot planted English royal standard June 24, 1497, probably on Cape Breton Island, when he discovered North America, which Columbus never saw.

195. Dutch West Indies Company. This flag appeared in New York Harbor in 1622, when the Dutch West Indies Company, formed in 1621, came to control fur trade of the New World. Letters "G. W. C" stand for "Geootroyeerde West-Indische Compagnie," Dutch West Indies Company.

Historic Banners of Latin America

198. First Mexican Flag. Adopted 1821, when Mexico became independent. Coat-of-arms changed slightly in 1917, but central device and that on modern Mexican flag represent same legend (see 113).

199. Bolivar. Under this flag Simon Bolivar drove imperial Spain from northern provinces of South America, early in 19th century. He is the national hero of Bolivia, Peru, Venezuela, Colombia, and Ecuador; the three last named based their flag designs on his banner. One sees pictures of his flag, and flags of the countries that adapted his design, with varying shades of red, yellow, and blue. That is because the original flag has faded and no one knows exactly what the colors ought to be.

200. Spanish Flag in Mexico. This flag, carried by Spanish troops in War of Mexican Independence, is preserved in museum at Mexico City. Design is raguled (obliquely indented) cross of Spanish Bourbons, with addition of crown-crested coat-of-arms on ends of cross.

201. Brazilian Empire. When Napoleon drove the royal family from Portugal in 1808, they took refuge in Brazil, where Dom John VI took the throne and raised this flag. For the first time a colony became the seat of government of a mother country. In 1889 Brazil revolted and set up its own government, making new flag along lines of the old (see 78).

202. Pizarro. This standard is said to have been carried by Pizarro when he conquered Cuzco in 1533. It hung in Cuzco Cathedral until 1824. Then it was presented by people of Cuzco to General de Sucre, trusted lieutenant of Bolivar and victor in battle of Ayacucho, which broke power of Spain in South America. General de Sucre presented it to Bolivar, who gave it to his native city of Caracas, Venezuela, where it is preserved. Flag of scarlet damask has on one face the arms of Charles V, on other is shown Apostle St. James (Santiago) mounted on white horse. When it was received in Caracas, the side showing painted and embroidered figure of St. James was covered with white satin. It was not discovered until 1872 that the satin was only a protection to the interesting embroidery underneath.

203. Tlaxcallan Banners, Mexico. The Tlaxcallans, fierce mountain tribe, foes of Aztecs, became allies of Cortez. Their banners were made of precious metals and bright colored quetzal feathers mounted on wooden staffs. The Indians lashed the banners to their backs to allow free use of the arms.

204. Banner of Hidalgo. This flag was carried by Mexican soldier priest, Miguel Hidalgo, who led revolt against Spanish rule shortly after United States had gained independence.

196. France, 1365-1574. This famous banner was carried in American wilderness by French explorers, Joliet and Marquette, who explored the upper Mississippi River, and by La Salle, Iberville, and Bienville, conspicuous figures in history of Louisiana.

197. France, Louisiana, 1803. This flag of France flew over a large part of what is now American soil until the Louisiana Purchase. It was hauled down on Dec. 20, 1803.

The design shows the Virgin of Guadalupe, the patron saint of Mexico. Hidalgo was executed at Chihuahua in 1811. Mexico was not free until 1821. Banner of Hidalgo is preserved in National Museum at Mexico City.

205. Aztec Standard, Battle of Otumba. At battle of Otumba, in August 1521, Cortez felled the Aztec general with the battle standard tied to his back, and Salamanca cut away the standard. This loss demoralized Aztecs and won battle for Spaniards. Cortez presented standard to Tlaxcallan chieftain, Maxisca, and Spanish king caused this emblem to be represented on Salamanca's coat-of-arms. Aztec name for standard was "Quetzalteopamilt." Design shows golden sun surrounded by fine plumes of quetzal, national bird of Guatemala, which never survives captivity. This illustration of standard is taken from Lienzo of Tlaxcalla, an important document painted by Indians in hieroglyphics on long bands of linen to relate conquest of Mexico. Its 86 pictures show Spanish knights riding in battle armor and Tlaxcallans running beside them with crude weapons and gaudy banners.

206. Standard of Cortes (Cortez). Around picture of Virgin appears legend in Spanish "This standard was that carried by Hernando Cortez in the Conquest of Mexico." It hangs in the National Museum at Mexico City, a relic of days when Montezuma ruled at Tenochtitlan (now Mexico City), the Aztec capital. The Spanish spelling is Cortes.

207. Army of the Andes. This silken flag was called "the banner of the sun." It was embroidered, and its edges decorated with precious stones, by the women of Mendoza City, Argentina. The revolutionary leader, San Martin, carried it over the Andes into Chile, which he and his "Army of the Andes" liberated from Spanish rule. Flag was publicly consecrated in Mendoza City on Jan. 5, 1817. As it was unfurled, a salute of 21 guns was fired. General San Martin and his soldiers swore to defend it with their lives, and their oath was followed by a salvo of 25 guns. Arms in center, liberty cap on pike, above a row of five volcanoes, with rising sun and rainbow behind, appear in various adaptations in flags of several South American countries. San Martin, a few years later, carried north into Peru another flag, of three horizontal stripes, blue, white, blue, similar to flag of Argentina (see 73). This also has been adapted by South American countries for modern flags, but shade of blue changes, as one régime attempts to follow blue of faded original flag, and another tries to show blue as it was before flag faded. Therefore one may see representations of flags of Argentina, Colombia, Costa Rica, Guatemala, Honduras, Nicaragua, Panama, El Salvador, Uruguay, and Venezuela in almost any colors.

Flag Research and Its Difficulties

[Editor's Note—The preceding illustrations and descriptions of historic and modern flags represent the work of two years, and the careful checking of information from many sources. Governments do not keep flag data conveniently at hand. Flags hurriedly chosen and designed by new nations following the World War were in some instances not adequately specified, and have been incorrectly reproduced by seemingly trustworthy authorities.

The sifting of such errors required the writing of hundreds of letters to embassies, foreign countries, heraldry experts, and custodians of archives. To obtain correct data our staff artist spent a fortnight at the Library of Congress, Washington, D. C., whose assistance we gratefully acknowledge.

It was particularly necessary to weigh carefully the data concerning early American flags, as these were necessarily designed and made under circumstances of national excitement, when there was little thought of record-keeping.

Many current reproductions of flags by reputable publishers are inexact because of the difficulty and expense of representing the varied and sometimes unusual colors appearing in flags. No pains or cost have been spared to render exactly the true colors of the flags shown on our four colored pages.

In cases of flags which are habitually manufactured contrary to their specifications, or of flags whose proper design, color, or significance is actually in doubt, we have been guided by popular use, preference, or tradition.

Traditions and Code of the United States Flag

MANY traditions have grown up regarding the display and use of the United States flag. These traditions are intended as marks of respect and are widely observed. The Army and the Navy have their own regulations, but these do not apply outside the armed services. To supply a guide to civilians for the proper use and display of the flag, a code was drawn up at a National Flag Conference held in Washington on June 14-15, 1923. This was revised by the Second National Flag Conference, May 15, 1924. Finally, in June 1942, Congress adopted a resolution (amended December 1942) which made the flag code into a law.

The code, as set forth below, embodies the provisions of the congressional resolution.

1. The Flag should be displayed only from sunrise to sunset, or between such hours as may be designated by proper authority. It should be displayed on national and state holidays, and on historic and special occasions. The Flag should always be hoisted briskly and lowered slowly and ceremoniously.

2. When carried in a procession with another flag or flags, the Flag of the United States of America should be either on the marching right, that is, the Flag's own right, or, when there is a line of other flags, the Flag of the United States of America may be in front of the center of that line.

3. When displayed with another flag against a wall from crossed staffs, the Flag of the United States of America should be on the right, the Flag's own right, and its staff should be in front of the staff of the other flag.

4. When a number of flags are grouped and displayed from staffs, the Flag of the United States of America should be at the center or at the highest point of the group.

5. When flags of states or of cities or pennants of societies are flown on the same halyard with the Flag of the United States of America, the National Flag should always be at the peak. When flown from adjacent staffs, the Flag of the United States of America should be hoisted first and lowered last. No flag or pennant should be placed above or to the right of the Flag of the United States of America.

6. When flags of two or more nations are displayed they should be flown from separate staffs of the same height and the flags should be of approximately equal size. (International usage forbids the display of the flag of one nation above that of another nation in time of peace.)

7. When the Flag is displayed from a staff projecting horizontally or at an angle from the window sill, balcony, or front of building, the union of the Flag should go clear to the peak of the staff unless the Flag is at half-staff.

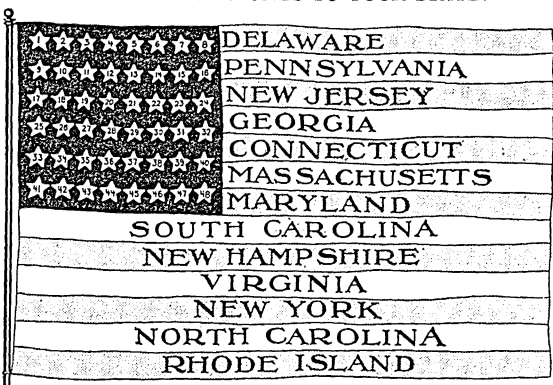
8. When the Flag is displayed in a manner other than by being flown from a staff, it should be displayed flat, whether indoors or out. When displayed either horizontally or vertically against a wall, the union should

be uppermost and to the Flag's own right, i.e., to the observer's left. When displayed in a window it should be displayed the same way, that is, with the union or blue field to the left of the observer in the street. When festoons, rosettes or drapings of blue, white, and red are desired, bunting should be used, but never the Flag.

9. When displayed over the middle of the street, as between buildings, the Flag should be suspended vertically with the union to the north, in an east and west street, or to the east in a north and south street.

10. On a speaker's platform the Flag, if used flat, should be placed above and behind the speaker. It

WHICH STAR BELONGS TO YOUR STATE?



| | |
|-----------------------------------|----------------------------------|
| 1. Delaware, Dec. 7, 1787 | 25. Arkansas, June 15, 1836 |
| 2. Pennsylvania, Dec. 12, 1787 | 26. Michigan, Jan. 26, 1837 |
| 3. New Jersey, Dec. 18, 1787 | 27. Florida, March 3, 1845 |
| 4. Georgia, Jan. 2, 1788 | 28. Texas, Dec. 29, 1845 |
| 5. Connecticut, Jan. 9, 1788 | 29. Iowa, Dec. 28, 1846 |
| 6. Massachusetts, Feb. 6, 1788 | 30. Wisconsin, May 29, 1848 |
| 7. Maryland, April 28, 1788 | 31. California, Sept. 9, 1850 |
| 8. South Carolina, May 23, 1788 | 32. Minnesota, May 11, 1858 |
| 9. New Hampshire, June 21, 1788 | 33. Oregon, Feb. 14, 1859 |
| 10. Virginia, June 20, 1788 | 34. Kansas, Jan. 29, 1861 |
| 11. New York, July 26, 1788 | 35. West Virginia, June 20, 1863 |
| 12. North Carolina, Nov. 12, 1789 | 36. Nevada, Oct. 31, 1864 |
| 13. Rhode Island, May 29, 1790 | 37. Nebraska, March 1, 1867 |
| 14. Vermont, March 4, 1791 | 38. Colorado, Aug. 1, 1876 |
| 15. Kentucky, June 1, 1792 | 39. North Dakota, Nov. 2, 1889 |
| 16. Tennessee, June 1, 1796 | 40. South Dakota, Nov. 2, 1889 |
| 17. Ohio, Nov. 29, 1802 | 41. Montana, Nov. 8, 1889 |
| 18. Louisiana, April 30, 1812 | 42. Washington, Nov. 11, 1889 |
| 19. Indiana, Dec. 11, 1816 | 43. Idaho, July 3, 1890 |
| 20. Mississippi, Dec. 10, 1817 | 44. Wyoming, July 10, 1890 |
| 21. Illinois, Dec. 3, 1818 | 45. Utah, Jan. 4, 1896 |
| 22. Alabama, Dec. 14, 1819 | 46. Oklahoma, Nov. 16, 1907 |
| 23. Maine, March 15, 1820 | 47. New Mexico, Jan. 6, 1912 |
| 24. Missouri, Aug. 10, 1821 | 48. Arizona, Feb. 14, 1912 |

There is no legal or other official authority for assigning the stars in the Flag to certain states. There is, however, a popular wish to give each state a definite star, according to the order in which it ratified the Constitution or entered the Union, with the stripes similarly assigned to the thirteen original colonies. In the design above, the stars are numbered as follows:

should never be used to cover the speaker's desk, nor to drape over the front of the platform. If flown from a staff it should be on the speaker's right.

11. When used in connection with the unveiling of a statue or monument, the Flag should form a distinctive feature during the ceremony, but the Flag itself should never be used as the covering for the statue. Bunting may be used for this purpose.

12. When flown at half-staff, the Flag is hoisted to the peak for an instant, then lowered to the half-staff position; but before lowering the Flag for the day it is raised again to the peak. By half-staff is meant hauling down the Flag to one-half the distance between the top and bottom of the staff. If local conditions require, divergence from this position is permissible. On Memorial Day, May 30th, the Flag is displayed at half-staff from sunrise until noon and at full staff from noon until sunset; for the Nation lives and the Flag is the symbol of the living Nation.

13. Flags flown from fixed staffs are placed at half-staff to indicate mourning. When the Flag is displayed on a small staff, as when carried in parade, mourning is indicated by attaching two streamers of black crepe to the spear head, allowing the streamers to fall naturally. Crepe is used on the flag-staff only by order of the President.

14. When used to cover a casket, the Flag should be placed so that the union is at the head and over the left shoulder. The Flag should not be lowered into the grave nor allowed to touch the ground. The casket should be carried foot first.

15. When the Flag is displayed in the body of the church it should be from a staff placed on the congregation's right as they face the clergyman. The service flag, the State flag, or other flag should be at the left of the congregation. If in the chancel or on the platform, the Flag of the United States of America should be placed on the clergyman's right as he faces the congregation and the other flags on his left.

16. When the Flag is in such a condition that it is no longer a fitting emblem for display, it should not be cast aside or used in any way that might be viewed as disrespectful to the National colors, but should be destroyed as a whole, privately, preferably by burning or by some other method in harmony with the reverence and respect we owe to the emblem representing our Country.

Cautions

1. Do not permit disrespect to be shown to the Flag of the United States of America.

2. Do not dip the Flag of the United States of America to any person or anything. The regimental color, State flag, organization flag, or institutional flag will render this honor.

3. Do not display the Flag with the union down except as a signal of distress.

4. Do not place any other flag or pennant above or to the right of the Flag of the United States of America.

5. Do not let the Flag touch the ground or the floor, or trail in the water.

6. Do not place any object or emblem of any kind on or above the Flag of the United States of America.

7. Do not use the Flag as drapery in any form whatever. Use bunting of blue, white, and red.

8. Do not fasten the Flag in such a manner as will permit it to be easily torn.

9. Do not drape the Flag over the hood, top, sides, or back of a vehicle, or of a railroad train or boat. When the Flag is displayed on a motor car, the staff should be affixed firmly to the chassis, or clamped to the radiator cap.

10. Do not display the Flag on a float in a parade except from a staff.

11. Do not use the Flag as a covering for a ceiling.

12. Do not carry the Flag flat or horizontally, but always as in a parade, aloft and free.

13. Do not use the Flag as a portion of a costume or of an athletic uniform. Do not embroider it upon cushions or handkerchiefs nor print it on paper napkins or boxes.

14. Do not put lettering of any kind upon the Flag.

15. Do not use the Flag in any form of advertising nor fasten an advertising sign to the pole from which the Flag is flying.

16. Do not display, use, or store the Flag in such a manner as will permit it to be easily soiled or damaged.

Proper Use of Bunting

Bunting of the National colors should be used for covering a speaker's desk, draping over the front of a platform, and for decoration in general. Bunting should be arranged with the blue above, the white in the middle, and the red below.

Salute to the Flag

When the Flag is passing in parade or in a review, all persons present should face the Flag, stand at attention, and salute. Those present in uniform should render the right-hand salute. When not in uniform, men should remove the headdress with the right hand and hold it at the left shoulder, the hand being over the heart. Women should salute by placing the right hand over the heart. The salute to the Flag in the moving column is rendered at the moment the Flag passes.

Salute When Giving the Pledge to the Flag

In pledging allegiance to the Flag of the United States of America, the approved practice in schools, which is suitable also for civilian adults, is as follows:

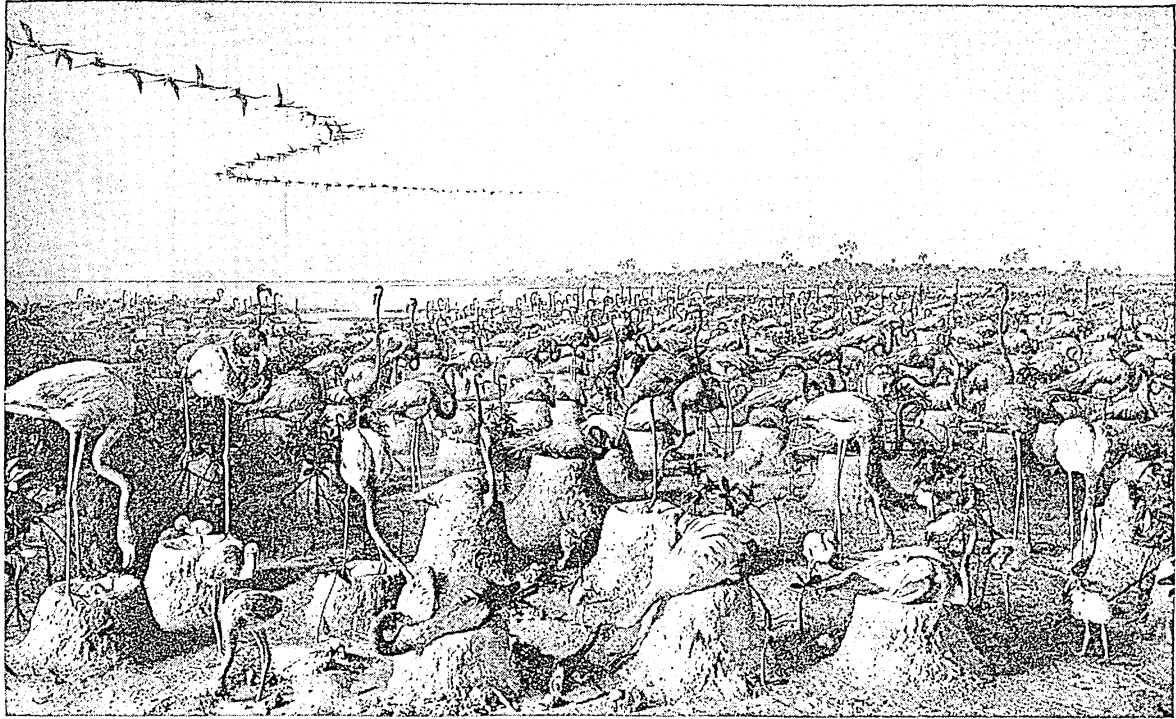
Standing with the right hand over the heart, all repeat together the following pledge:

"I pledge allegiance to the Flag of the United States of America and to the Republic for which it stands.

"One Nation indivisible, with liberty and justice for all."

The President of the United States is empowered to alter, modify, or repeal by proclamation any rule or custom pertaining to the use and display of the Flag whenever he deems it to be desirable

FAMILY LIFE IN FLAMINGO TOWN



The day's fishing is done, the mother flamingoes are on their nests, the fathers are standing about gossiping, and the children are playing a few evening games before going to bed. Notice what neighborly birds they are—all crowded together, hundreds and hundreds of them, and yet getting along quite peacefully. Those nests are built of scraped-up mud, with a shallow cup at the top. You can see an egg lying in the third one from the left. In the second from the left is a young one, just hatched. In the middle are several mothers squatting on their homes; one of them is already asleep, with her head tucked under her wing. Another is twisting down her long neck scooping up a bit of food. This picture is from a group in the American Museum of Natural History. The front figures are stuffed specimens, while the background consists of a painting.

FLAMINGO. A more curious combination of beautiful coloring and ungainly form could scarcely be imagined than is presented by the flamingo. A man who had been fortunate enough to see a flock of these great birds on the wing compared it to "a gigantic brilliantly rosy scarf, waving to and fro in mighty folds as it flies away." But a single flamingo viewed at close range is anything but a graceful creature. In shape it is midway between a goose and a stork, ranging when full grown between 5 and 6½ feet in height. Its humped body is supported on legs amazingly long and thin, while its slender neck—limber as a snake—curves upward like a big letter S, and ends in a small head with a great flat down-curved beak.

The lower part of this beak forms a deep broad box, into which the upper part fits like a cover. When the bird is feeding on shell fish or water plants in the shallow mud flats, the neck is twisted like a corkscrew until the head is upside down; then the top of the beak is pushed along through the mud like a scoop shovel, gathering in the food morsels.

There are several species of flamingoes, mostly living in tropical and sub-tropical countries. Of these the most beautiful in color is the American scarlet flamingo (*Phoenicopterus ruber*) occasionally seen in the marshes of Florida and Louisiana. They

are far more plentiful in the West Indies and along the coasts from Yucatan to Brazil.

Thousands of these birds gather in remote places during the nesting period. Each female builds a curious mound of mud like a tiny volcano, in the crater of which a single egg is laid. On this the mother sits with legs drawn up like a grotesque statue on a pedestal. The young are hatched in white down with a straight bill, which gradually acquires the crook. (For illustration in colors see Birds.) In zoölogical gardens flamingoes often lose their bright colors, but these can be restored by feeding with proper food.

FLANDERS. The name given in the Middle Ages to a thriving district extending along the North Sea southward and westward from the River Scheldt to the Strait of Dover. Parts of Flanders are now included in the kingdom of the Netherlands and parts in northern France; but the greater part lies in Belgium, where about half the people still speak "Flemish," a tongue akin to the language of the Dutch. (See Belgium.)

FLATFISH. This is the story of the fish who was scared out of his shape. A long, long time ago, when birds had teeth and the ancient ichthyosaurus swam in the oceans that covered northern Europe, there lived, we are told, a fish that was very tall from top

to bottom, but very thin from side to side. He was shaped like the bladder of a football before the air is blown in. He had a small head and narrow mouth so he couldn't fight his enemies, and he hadn't the speed to escape them, nor could he readily hide his strange figure. Yet his flesh was tender and succulent, and he made an easy meal as he floundered through the water with his big flat sides exposed. In fact, he and the members of his family were in danger of being all devoured.

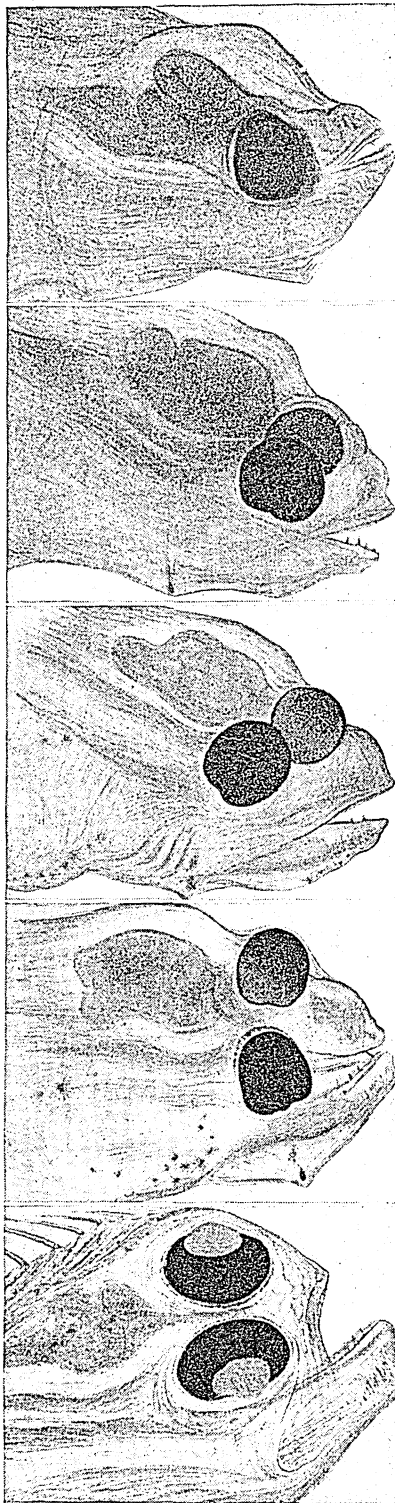
But the story runs that one day one of these young fish discovered he could dodge the swift swoop of his foes by turning quickly on his side and lying flat against the bottom. The result was that he survived to a ripe old age, while the others were killed and eaten. His descendants learned the trick from him and after several thousand years, these fish formed the permanent habit of traveling and resting entirely on their sides.

Presto, Change! when He Lies on His Side

Meanwhile an amazing thing happened. While they were lying on their sides, one eye, of course, lay buried in the mud where it was useless, and the mouth was set at an awkward angle for feeding. We may imagine, then, that for generations these fish tried, while still lying on their sides, to twist their heads around so the buried eye would be out where it could see, and the jaws reach a more effective position. They finally succeeded in part, but their heads would only twist half as far as they liked, and the lower eye was still half buried. So gradually this eye left its place and traveled around the top of the head until it came out on the upper side, next to the eye which was already there. Thus, with two good eyes to watch for danger, these fishes got along very well.

Such is the ancestral history of the modern flatfishes, from the huge halibut to the flounder and the small sole. But although this transformation of shape prob-

THE "TRAVELING" EYE!



The pictures show how one of the eyes of the flatfish travels from one side of his head to the other, as the fish grows up. The fainter eye is on the other side in the top picture, just coming "over the top" in the third, and in final position in the bottom view.

ably took thousands of years, the young flatfish today inherit the early habits of those remote forefathers who swam upright. When they are hatched from the eggs, these youngsters at first are upright in the water and have an eye on each side of their head. As they grow older, they come to lie on one side and their head begins to twist out of shape; the under eye comes out on top, the mouth turns at an oblique angle, and the whole process of evolution is gone through again in the lifetime of each fish. This is the reason for the strange deformed shape of the flounder tribe.

The flatfish family is a large one, consisting of nearly 500 species. For some mysterious reason, a few of these lie on their right sides, but the great majority prefer the left. The under side, which is not exposed to the light, is whitish, while the upper is usually dark colored. However, this color-scheme, which is designed to make the fish invisible to his foes, changes with the surroundings. For instance, if a flounder is put in an aquarium with a glass bottom through which light is allowed to shine, the under side will turn brown. (See Protective Coloration.)

Varieties of Flatfish

Almost all flatfish are valued highly as food: The European sole is considered by many the most delicious of all fish. Some of the flounders found along American coasts are called soles and are excellent for the table. The common flounder or plaice is also a toothsome fish. But the most important of the whole family is the lordly halibut. These grow to an immense size, one caught from the coast of Sweden having weighed 720 pounds. They are considered best, however, at about 100 pounds. Large halibut fisheries exist on the coasts of the United States, and the shipping of halibut from the western centers is an important business. A train called the "halibut express," com-

posed of refrigerator cars loaded entirely with these fish, runs from Vancouver to Boston, making the through trip from the Pacific to the Atlantic in four days, faster than any passenger service.

Other members of the flatfish family are the turbot and the sand dab.

Scientific name of halibut, *Hippoglossus hippoglossus*; of sole, *Achirus lineatus*; of flounder or plaice, *Paralichthys dentatus*. (See also Fish.)

FLAX. A field of common flax in full bloom is like a great lake of delicate blue. It ripples softly as the dainty blossoms, like mountain bluebells, sway and nod to every breeze.

These pretty fields are cultivated both for the dark-brown seed and for the soft strong fiber of the flax plant, which is two feet or more in height.

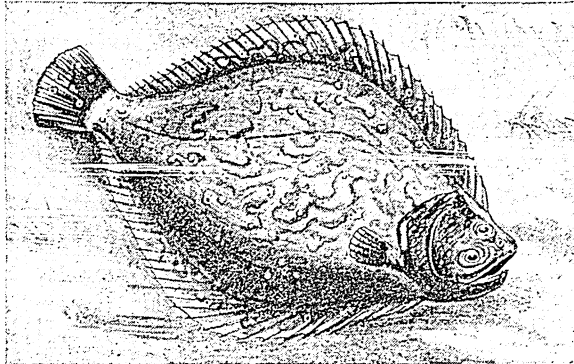
Each bushel yields from 17 to 20 pounds of "linseed" oil, which is used for mixing paints, making printer's ink, patent leather, linoleum, and oilcloth. The

oil cake is a by-product highly esteemed for fattening cattle (see Fats and Oils). The fiber is, next to cotton, the most generally employed textile in the whole range of vegetable fibers. From it is produced linen, so widely used in making choice tablecloths and napkins, towels, handkerchiefs, exquisite laces, and a great variety of other articles (see Linen).

If only the flax seed is to be used, the crop is harvested with a mower

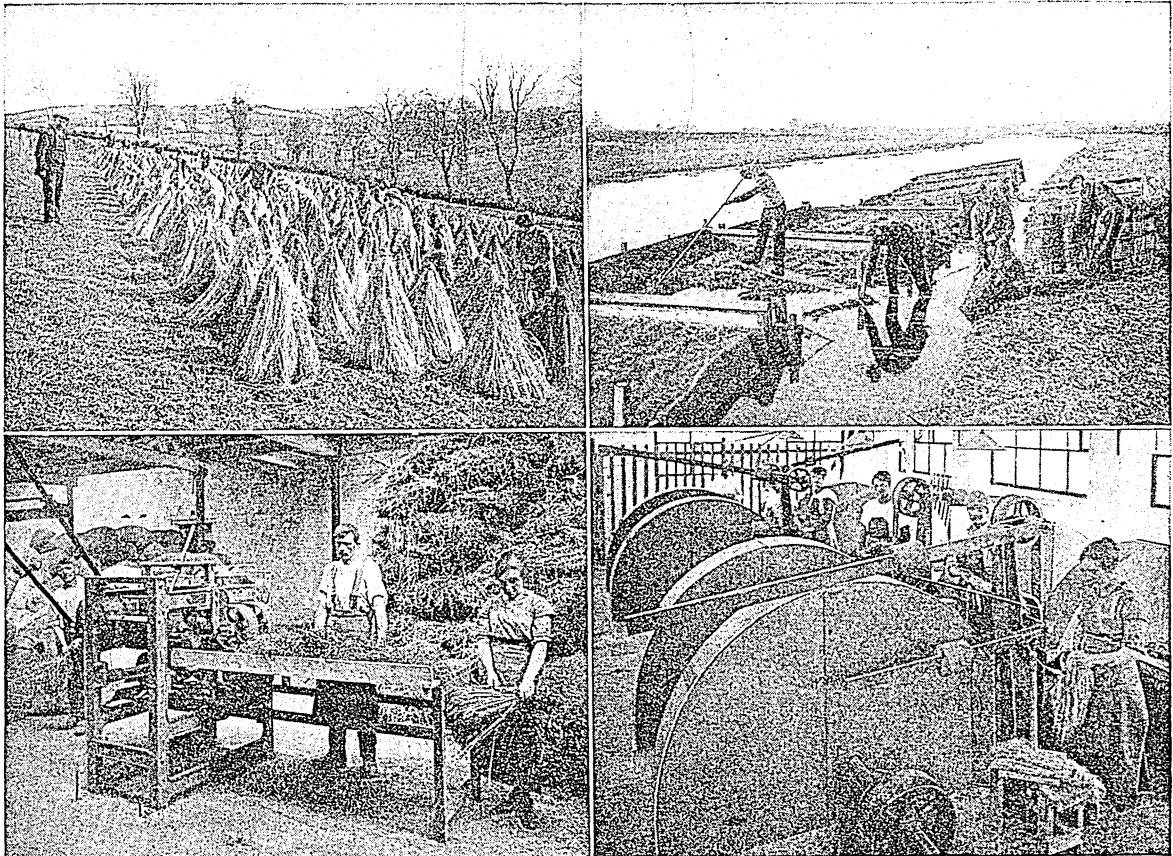
after the seeds are ripe and brown. But if the fiber is to be used the plants must be pulled by hand before they are quite mature. The pulled flax is then

THE FISH THAT CHANGES SHAPE



This English Flounder swims upright in early life, but on his side when grown. Thereupon his mouth twists and the "under eye" comes to the top side, thus giving him a twisted head.

GLIMPSES OF IRELAND'S FAMOUS FLAX INDUSTRY



When flax fibers are desired for linen-making, the unripe flax is pulled by hand and stacked as we see in the upper left-hand picture. When dry, its seeds are removed either with a hand comb or by such machines as the one in the lower left-hand corner. The next process is "retting," or allowing the pithy core to rot in water. Retting in stream water is shown in the upper right-corner. The last picture shows "scutching," in which machines break the rotted pith from the stem and leave the fibers to be heckled, or combed.

tied together in bundles and left upright in the field until it is dry, when the seeds are separated from it; or the separation is made right after pulling, with an iron comb, called a "ripper."

Next the flax is "retted" or soaked by various methods, usually in tanks, pools, or rivers, until through the action of bacteria the fiber is loosened from the decaying woody part of the stalk; it is then spread out on the grass to bleach and dry. The pure fiber is next freed from the core by two operations—"breaking" (cracking the woody portions of the stems), either by hand or by revolving grooved rollers; and cut lengthwise by a "scutching blade" or a "scutching machine." Finally, the flax is "heckled" or combed by hand or by machine. The short coarse fibers make the "tow" that was sometimes used for homespun clothes such as pioneers wore.

Flax grows best in a moderately cool, damp climate. The larger part of the fiber flax is produced by Russia, Poland, and Belgium, and the chief producers of seed flax are Argentina, the United States, and Russia.

Flax has been raised in Europe since the Stone Age, and in the United States since about 1630. With the increased use of cotton, fine flax culture in the United States and Canada steadily declined, although during the World War of 1914-18 flax fiber rose in value because of the extensive use of linen for the wings of airplanes. Flax is now grown in the United States and Canada chiefly for the seed, and is usually of a different variety from that grown for fiber. North Dakota is the leading flax state of the Union. Flax is very exhausting to the soil and cannot be planted year after year on the same plot without extensive and careful application of fertilizers. In the western states and provinces it is usually the first crop put on newly plowed prairie land.

FLEA. This is one of the most troublesome little tormentors of the insect world. In recent years it has also been recognized as one of the most dangerous,

for it carries the germ of bubonic plague and the virus of typhus fever from rats to man. Old World typhus is spread by human body lice, but a local strain of this disease is transmitted by rat fleas in the United States. Fleas are tiny insects, with bodies thin and flattened from side to side (as a fish is flattened). This makes it easy for them to slip quickly about among the hairs of animals upon which they live, for all fleas are parasitic (see Parasites)

Fleas have no wings, but they are wonderful jumpers by reason of their long frog-like hind legs. Their heads have a long sharp sucking beak, with which they puncture the skin and suck the blood.

The female flea scatters her eggs about in rugs and carpets and in places where animals sleep. The larvae or young look like little hairy worms; they have biting mouth parts,

and live on animal tissues and filth.

Fleas' especially infest rats, dogs, cats, rabbits, pigeons, and poultry. There is also a kind that prefers to live upon human beings. This species does not occur in the United States to any great extent, but the dog-and-cat type, which will also attack man if given the chance, is found everywhere. To rid a dog or cat of fleas it should be scrubbed in

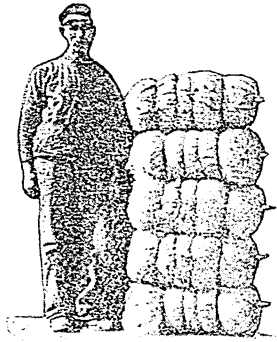
hot soapsuds and dusted with insect powder, and its sleeping place carefully cleaned.

Scientific name of dog-and-cat flea, *Ctenocephalus canis*; of common flea of Old World, *Pulex irritans*. There are more than 450 known species of fleas, all parasitic on mammals or birds, and constituting the order *Siphonaptera*.

FLINT. The mineral called flint is a variety of quartz. It consists almost entirely of silica, sometimes containing lime, oxide of iron, water and carbon. It varies in color from almost black to light brown, red, yellow, and gray-

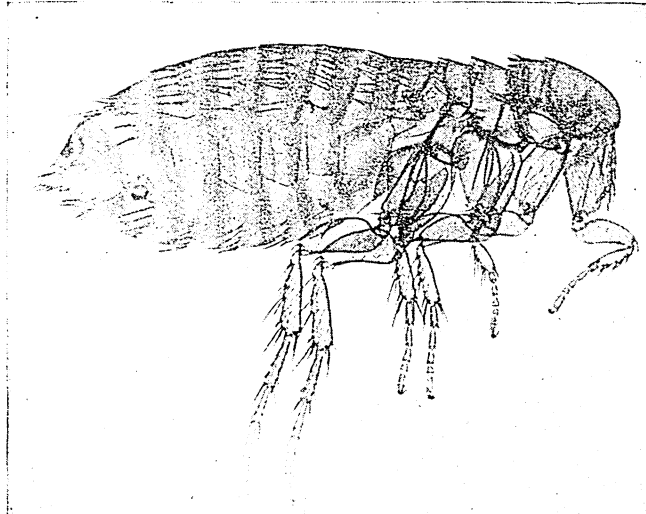
ish-white, and is sometimes mottled or spotted, but is commonly gray or smoky brown. Flint was largely used by prehistoric peoples to make axes, arrow-heads, knives, and other implements. In some regions it is still used to strike sparks for fire lighting.

READY FOR THE WEAVER



The bundle is heckled flax awaiting shipment to the spinning mill, where it will be spun into thread for weaving into linen cloth.

THE FLEA THAT CARRIES PLAGUE



One of the principal agents in spreading bubonic plague is this Rat Flea, shown greatly enlarged. The details of the process are not completely known, but in general we know that the flea receives the bacillus from infected rats, and transmits it to any person it bites.

The CAUSES of FLOODS and How Men FIGHT THEM

FLOODS. Long before men began to spread over the earth, floods ravaged the surface of the land. At the very dawn of history we find men afflicted by them. Stories of flood tragedies, like the epic of Noah and the Ark, loom large in the traditions of many ancient peoples. Traces of the floods referred to in these stories have been uncovered by archeologists.

Floods in uninhabited lands are merely a part of the natural work of rivers in remodeling the earth's surface (see *Physiography; Rivers*). But floods where people live and work bring property damage, suffering, and death. With the increase of the world's population through the centuries, the effects of floods have become in many ways more disastrous. Along the great river valleys, which are the natural pathways of floods, lie our most fertile farms, our greatest cities, our easiest lines of transportation. Millions of people and vast concentrations of wealth are now situated in these danger zones.

Once floods were accepted as accidents, of the kind which the law calls "acts of God," unpredictable and unavoidable. But men have learned more about the part the rivers play in the great *hydrologic cycle* that carries water vapor from the oceans, lets it fall as rain on the land, and carries it back through the rivers to the ocean again. With this knowledge they have learned to predict many floods, to control the damage done by some of them, and even to prevent a few entirely.

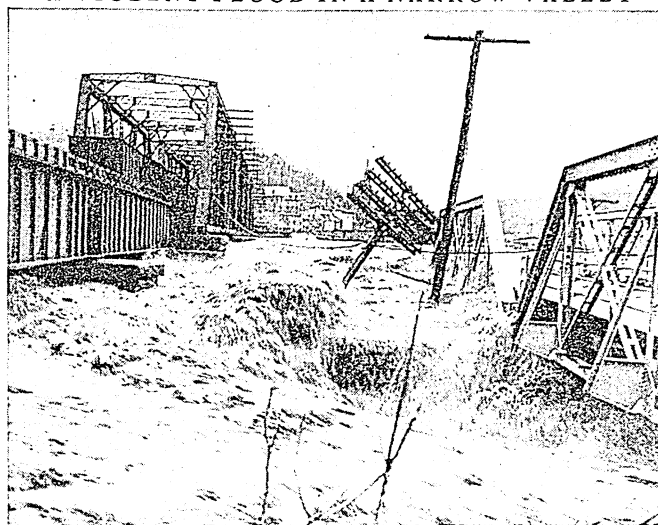
Why Floods Occur

The whole area drained by a river may be likened to a giant sponge. It soaks up a large proportion of the moisture that falls upon it. A part of what is left evaporates. The rest (called the *run-off*) flows into the streams. During the rainy seasons the ground becomes saturated and the moist air allows little evaporation, so that the run-off is much larger. The same thing happens when winter snows melt. If the ground remains frozen, no moisture can soak into it, and virtually all the snow water runs off.

Most rivers can carry the run-off from normal rains or thaws without overflowing, because river beds are shaped by the waters that usually flow through them year after year. The big disastrous floods come when

unusual rains or thaws have occurred over a wide territory. For example, the great Mississippi River flood in the spring of 1927 was due to heavy rains the previous year from Pennsylvania to Kansas, followed by unusual winter and spring rains in the Mississippi Valley itself. The New England floods of 1927 came more suddenly. After the ground was thoroughly saturated by heavy autumn rains, a great storm poured eight inches of rain in two days into the Winooski and Connecticut valleys. Terrific disaster resulted.

A VIOLENT FLOOD IN A NARROW VALLEY



Flood waters are most dangerous when confined in narrow valleys. We can judge their force from this view in the spring of 1936 at Harpers Ferry, W. Va., where the Potomac and Shenandoah rivers meet. The section of a steel bridge at the right was carried more than half a mile by the torrent.

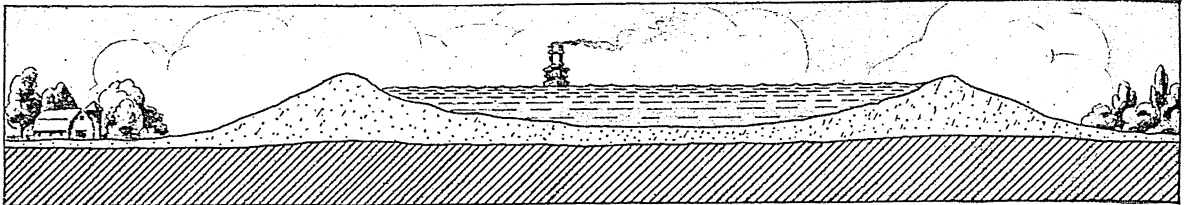
The record floods of 1936 in the north-eastern states came from still another set of circumstances. Heavy snows had piled up during a winter of unbroken cold, and the frost was deep in the ground. Early in March mild weather came suddenly, with great rains. A prodigious quantity of snow water and rain together swept down into the rivers, many of which were choked with broken ice. Swollen into raging torrents, the rivers swept over cities, destroyed bridges, and

drowned scores of people. The floods in the Ohio River basin early in 1937 were due to abnormally warm January weather with long-continued rains. The ground was already saturated by earlier thaws. The Ohio and its tributaries rose slowly but relentlessly until they finally broke all their previous flood records. Muddy waters stood deep in the streets of Cincinnati, Louisville, Paducah, and many other cities. More than 800,000 people were driven from their homes.

These examples suggest how difficult it is to forecast floods. To predict a flood on the lower Mississippi, for example, a weather forecaster in New Orleans must know conditions over the whole area from the Rockies to the Appalachians—how much snow is unmelted, how nearly saturated are the fields and forests, and what areas still have frozen topsoil.

The size and shape of a river channel determine how much water it can hold without overflowing its banks. Young rivers which have cut deep channels for themselves through mountainous country could carry a hundred times the amount of water brought them by the heaviest rains and snows. But older rivers flowing across level plains, like the lower

A RIVER FLOWING IN A CHANNEL ON TOP OF A MOUND



Mississippi River, have low banks, and valleys which rise gently at either side, so that points many miles from the channel are only a few feet above the water's surface (*see* Valleys).

When a great volume of water pours into a young river, the stream stays between the narrow walls of the valley but rises to astonishing heights. Thus Pittsburgh, located in a steep-sided valley, was flooded in 1936 to the tops of two-story and three-story buildings. In an older, flatter valley, floods are not so deep, but cover a greater area. The Mississippi flood of 1927 flooded nearly 30,000 square miles to a depth of only a few feet.

The higher the water rises, the more swiftly it flows and the greater its destructive power. Banks which have resisted years of constant wear from the rivers are eaten away by rushing flood waters in a few hours. Hurling along with express-train speed, a flood confined between valley walls may rip houses from their foundations, wash out bridges, and break open poorly constructed dams. Such floods have been known to pick up heavy locomotives and swirl them along like chips of wood.

Effects of Floods

Eight floods in historic times have taken more than 100,000 lives each, chiefly in China, Japan, India, and the Netherlands. Property loss from the Mississippi flood in the spring of 1927 and the New England floods in the fall of the same year amounted to about half a billion dollars.

The first step after a flood occurs is organization of immediate relief. Boats and rafts are found to rescue people marooned by the rising waters. Tent cities are set up to care for the homeless. Often floods, by interfering with river sewage disposal and contaminating city water supplies, increase the danger of epidemics. Then whole communities are inoculated against diseases. If the flood cuts off all the usual means of transportation, airplanes carry protective serums and other necessities to the isolated



The diagram at the top shows how some rivers build up their own beds and their own banks by silt deposits, until the channels are higher than the surrounding countryside and the danger from floods is increased. When levees, like the one shown in the lower picture, are constructed on each side of a stream to control floods, they sometimes produce a similar result, and if they break, the waters stray over a wide area.

regions. Such work is carried on by private citizens, the Red Cross, and governmental agencies.

The cost of rebuilding ruined homes and factories is sometimes covered by flood insurance, which many business firms and individuals carry (*see* Insurance). Levees and other defenses against floods which may have been destroyed must be rebuilt, often at enormous cost. To add

one foot to the height of the Mississippi levee system, for example, costs about 35 million dollars. Yet flood control projects cost far less than a single disastrous flood.

One way to avoid flood damage is to locate property where it is in no danger of being flooded. The story of the Tower of Babel tells of an attempt to escape flood damage in this way. But to follow this program would compel men to surrender to the flood-enemy many of their richest regions. From earliest times, therefore, people have settled in valleys and sought means to control floods rather than to avoid them.

Ancient engineers built earthen mounds to shut out the water. Such artificial embankments, called levees, held Chinese rivers in check for many centuries. This method was followed in American colonial days. New Orleans built a levee to protect itself from Mississippi floods as early as 1717.

Modern Levee Building

Since then levee building has progressed rapidly. Because a levee at one point confines the water there and raises the peak of flood waters upstream and downstream, levees once started usually have to be built at all the low points of a river system. Furthermore, a system of levees is only as strong as its weakest spot. Thus uniform height and strength are required.

The states took over levee construction on the Mississippi about 1850, and later the Federal government completed the system. It now includes 1,825 miles of embankment averaging 21 feet in height. Only a government which controls the river from end to end can safely supervise levee building. The damage

done by the great floods which for centuries have ravaged China has been due in part to the fact that the weak central government left the care of levees to local agencies. Smaller levee constructions, like the work of the Miami Conservancy District in Ohio, are carried on by state and local coöperation.

To keep the flood water from eating away the levee surfaces, long-rooted Bermuda grass is thickly sown on them, or mats woven of willow branches are fastened to them, or the lower slopes of the levees are covered with great asphalt "blankets" or surfaced with concrete slabs. *Jetties* built out into the stream at angles from the bank tend to slow down the current near the levees.

But levees, if unaided by other flood control devices, have many shortcomings. If they are set far back from the river, valuable land is wasted. If they are set too close, the crowded river may rise too high, and either flow over or cut through the embankments. Flood waters are muddy waters; a river left to itself deposits its burden of mud upon the flooded valley lands, enriching the soil and gradually building natural levees along the edges of its flood-plain. When a river is walled in by man-made levees, the mud is carried on to be lost forever in the ocean, or is deposited in the main bed of the river. This latter action gradually reduces the water-carrying capacity of the river and increases the danger of overflow.

Along many Chinese rivers this process of depositing mud on the beds has proceeded so far that the beds are built up higher than the surrounding lands. The river thus flows in channel along the top of a mound. When it breaks its banks, all of its waters are poured out over the countryside. Often the river finds a new channel, permanently inundating a new region and leaving deserted and arid the region that formerly depended upon its waters.

Other Flood Control Devices

To avoid the necessity of building higher and higher levees to hold greater and more disastrous floods, engineers have developed other methods of flood control. One such device is the *spillway*, or emergency channel to carry excess water to the sea by a different route. The spillway is shut off from the main channel by a *fuse levee* which permits water to pass only as the rising water approaches the danger line. Two such spillways protect the lower Mississippi; others are planned elsewhere (see Mississippi River).

Straightening and deepening a river channel both increase its capacity and reduce the damage done by the pounding of flood waters on the banks on the outer edges of curves. But in some cases straightening and dredging out the bottom only speed up the flood and cause added damage downstream. Dredging and straightening, therefore, are now done rather to improve navigation than to control floods.

Dams and the reservoirs behind them help to control floods. By emptying a dam before a flood is

expected, storage space is obtained in which the flood waters can be impounded, for gradual release later. Even if the reservoir is nearly full, it acts, as do lakes, like a safety valve. An amount of water which would add ten feet to the height of a river 100 feet wide would add only one foot to a reservoir or lake 1,000 feet wide. Moreover, evaporation from

the broad surface of a reservoir or lake is far greater than evaporation from the narrow surface of a river. Thus less water flows on to swell floods downstream.

Flood control dams are built to create big storage capacity, and are planned for rapid filling and emptying. Dams to improve navigation, on the other hand, are built to provide a long, narrow reservoir which deepens the channel upstream. Electric power dams are built to provide as great a drop as possible between the reservoir and the channel below. In spite of these different requirements, many-purpose dams can be built in some places, and help control floods at the same time that they serve other uses.

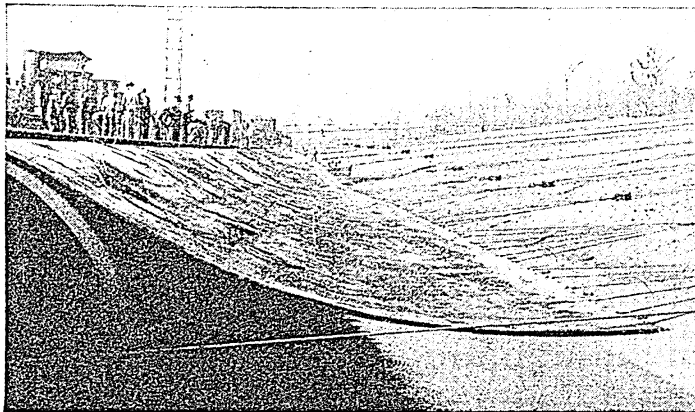
Flood Prevention Helps Flood Control

The engineering devices described seek to control floods after the water has entered the river. Land-use methods designed by conservation experts, however, keep water from reaching the rivers in dangerous amounts, by holding it on the land.

As we have seen, not all the rain which falls reaches the river. Some evaporates where it falls. Some is absorbed by the vegetation. Some is soaked up by the layer of decaying vegetation, or *humus*, which covers the soil in forests and grasslands. Some sinks, or *percolates*, into the soil and subsoil. Only the water which neither evaporates nor is absorbed runs off to cause floods.

Trees reduce run-off in several ways. Their leaves and branches absorb much water. The accumulation of dead leaves and branches forms an especially thick layer of humus, which can absorb several times its

RE-FACING RIVER LEVEES WITH ASPHALT



From the deck of the specially constructed barge at the left, an asphalt mattress or "revetment" is being hauled into position on the levee. Such mattresses protect levee surfaces from the gnawing action of flood waters.

own weight of water. Finally, the roots of trees soak up ground water from saturated earth, and permit it to evaporate from their leaves above, a process called *transpiration*. As a result, little or none of the rain falling on forest land runs off.

Dead blades of grass also accumulate on unplowed land to form water-absorbent humus. Grass reduces run-off in another way. Water cannot soak very quickly or very far into unplanted earth; a cake of water-proof mud is soon formed; the rest of the rain runs off. Grass stalks form funnels through which the water can percolate into the topsoil and later into the subsoil. Alfalfa, clover, and other closely planted, long-rooted plants have the same power to increase percolation, while widely planted crops like corn and fields lying fallow and unplanted hasten run-off.

The great westward movement across America, by cutting down the forests and plowing up the grasslands, increased the proportion of water which runs off to swell floods. To plant grass or forests in areas now planted in crops that increase run-off would of course be impractical, if flood control were the only benefit. But erosion control goes hand in hand with the reduction of run-off. The water carries with it large quantities of the richest topsoil to muddy the rivers and be lost in the ocean. American rivers carry an estimated 10 billion cubic feet of solid matter to the seas each year. Water erosion on hilly farms in some sections is proceeding so rapidly that only rocks and gullies are left after a single generation of planting.

Agricultural experts propose to return the steepest hills along the headwaters of American rivers to forest. By means of terracing, contour plowing, and a wise choice of plants, run-off and erosion are checked on gentler slopes. By damming gullies, run-off is slowed up and silt from above slowly rebuilds the eroded spots. Thus flood prevention and erosion control go hand in hand (see *Conservation*). Preventing soil erosion also aids flood control by slowing down the rate at which silt fills up the reservoirs behind flood-control dams.

Steps taken to lessen the effects of drought also aid in flood control. Lakes, swamps, and marshes once drained to make farm lands are being restored to their former condition in order to preserve the level of underground water in time of drought. At the same time this action reduces floods by increasing

evaporation, and by the safety-valve action of wide lakes or swamps on narrow rivers. Thus the problem of preventing and controlling floods is tied up with drought measures as well as with water power, navigation, soil conservation, and wise land use. (See also *Drought*.)

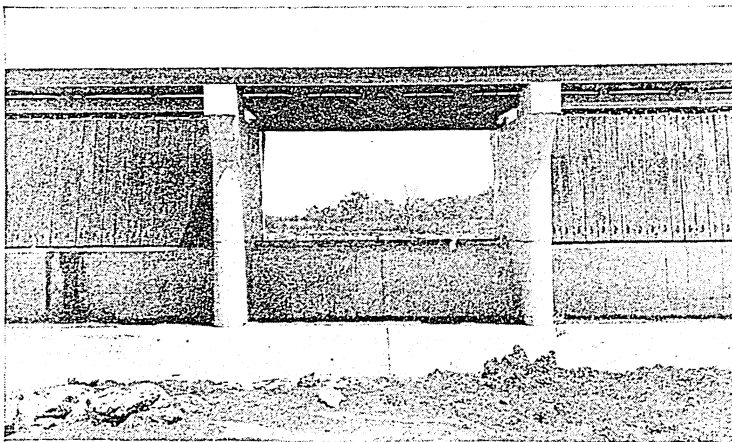
The Egyptians found a unique solution to these problems along the Nile many thousands of years ago. Each spring the Nile, fed by melting snows from Ethiopia and central Africa, overflows its banks for many miles on either side. Farmers in the valley build their homes on high land, but cultivate the river bottoms after each flood. The rich coating of river mud deposited each year maintains fertility, even after centuries of cropping. Catch basins throughout the valley have been dug to store flood waters for irrigating the valley during dry seasons. Great flood control projects have been built, in this instance not to stop floods but to ensure that they come regularly each year (see *Egypt*).

Ocean Floods

Often more disastrous than river floods are the great catastrophes which follow invasion of the land by the ocean. Volcanic eruptions may cause huge waves which swamp seacoasts far and near. The eruption of Krakatoa in 1883 dumped much rock and lava into the ocean, and formed waves which inundated whole districts in Java and Sumatra and were felt half-way round the world in South America. The

Lisbon earthquake of 1755 was followed by a similar flood. Hurricanes and tornadoes, especially if they strike the coast at high tide, create great waves which may engulf seaport cities. Such a hurricane-created flood swamped Galveston, Tex., in 1900, with a loss of 5,000 lives; another struck in 1915. Where land lies below the sea level

A SPILLWAY GATE FOR MISSISSIPPI FLOODS



When the Mississippi rises high enough to endanger New Orleans, 33 miles downstream, these gates or "needles" are raised. Through them flood waters surge harmlessly down the Bonnet Carré Floodway into Lake Pontchartrain and the Gulf.

and is separated from the sea by only a slim natural barrier, as in parts of the Netherlands, storms may wash away the barrier and flood whole inland districts. Thus Holland used to have terrific floods.

To shut out the ocean, Holland has successfully built great sea walls called *dikes*. Even today, the Dutch greet their ruler, not with "God Save Our Queen," but with "Hold the Sea." Galveston also built a great sea wall, and raised the level of the city by pumping in great quantities of sand from the floor of the ocean. (See *Galveston*; *Netherlands*.)

The RICHEST GEM in ITALY'S DIADEM

FLORENCE, ITALY. "The most beautiful and most famous daughter of Rome," as Dante called his beloved Florence, lies on the banks of the Arno in a fertile valley beyond which tower the rugged peaks of the Apennines. On all sides low hills covered with villas surround the city, which in Renaissance times was the artistic and intellectual capital of the world.

From these hills about Florence the scene is one of striking beauty. In the heart of the city rises the amazing dome of the big 13th century cathedral, and by its side is the exquisitely beautiful "campanile" or bell-tower built by Giotto. Near by is the baptistery, with Ghiberti's celebrated bronze doors. Encircling this striking group lies the ancient city—palace upon palace, church upon church, with narrow winding streets and plazas, and low, sharp-roofed dwellings in between. Farther out the newer quarters of the city stretch in all directions, with their pleasant boulevards, villas, and gardens aglow with the profusion of blossoms which have given Florence the name of the "city of flowers."

No End of Famous Names and Places

Every tower and every roof-tree in the old part of the town has its history. The narrow streets of this proud mercantile republic were filled for four fierce centuries with the conflicts of Guelph and Ghibelline, of the Neri (black) and the Bianchi (white) Guelphs, of the partisans of the Medici and the defenders of the republic. In such and such a house Dante lived, and over there Petrarch wrote one of his many sonnets to Laura, his lady love. Here Michelangelo carved his famous statue of the youthful David. There Leonardo da Vinci learned to paint. In the great public square before the civic palace Savonarola, the statesman-friar, died in flames amidst the jeers of the populace. From this spot a short walk will lead to the house of Vespucci, famous as the home of the Amerigo Vespucci who gave his name to the continents of North and South America.

The list of famous places and famous names is almost endless. Florence, the birthplace of the Renaissance, was not only Italy's capital in arts, but in science, literature, and statecraft, in skilled trades and in commerce.

Today the shrewd and enterprising qualities which made the early Florentines leaders of Italy are still in evidence. The modern Florentines carry on a lively trade in woollens, keeping up the tradition of the celebrated Woolweavers' Guild, the most powerful

"WHO can describe the enchanting view of this art-city of Tuscany and the world?" says a noted German historian. "Here everything betrays the work of generation after generation of ingenious men. Like a water-lily rising on the mirror of the lake, so rests on this lovely ground the still more lovely Florence, with its everlasting works and its inexhaustible riches. From the bold airy tower of the Palace, rising like a slender mast, to Brunelleschi's wondrous dome of the Cathedral, from the old house of the Spini to the Pitti Palace, the most imposing the world has ever seen,—all are full of incomparable grace. Each street of Florence contains a world of art; the walls of the city are the calyx containing the fairest flowers of the human mind;—and this is but the richest gem in the diadem with which the Italian people have adorned the earth."

of all their great gilds in the Middle Ages. Silks, wood products, and, above all, objects of art form a large part of the retail commerce of the city.

No other Italian city except Rome attracts so many art lovers each year. Its two famous picture galleries, the Uffizi and the Pitti, both former palaces of the Medici, contain collections of priceless value.

Almost every church in Florence has famous frescoes on its walls, while the tombs of the city's great men are embellished with notable sculpture. Michelangelo's famous statues over the tombs of Giuliano and Lorenzo de' Medici, in the church of San Lorenzo, are among the world's masterpieces.

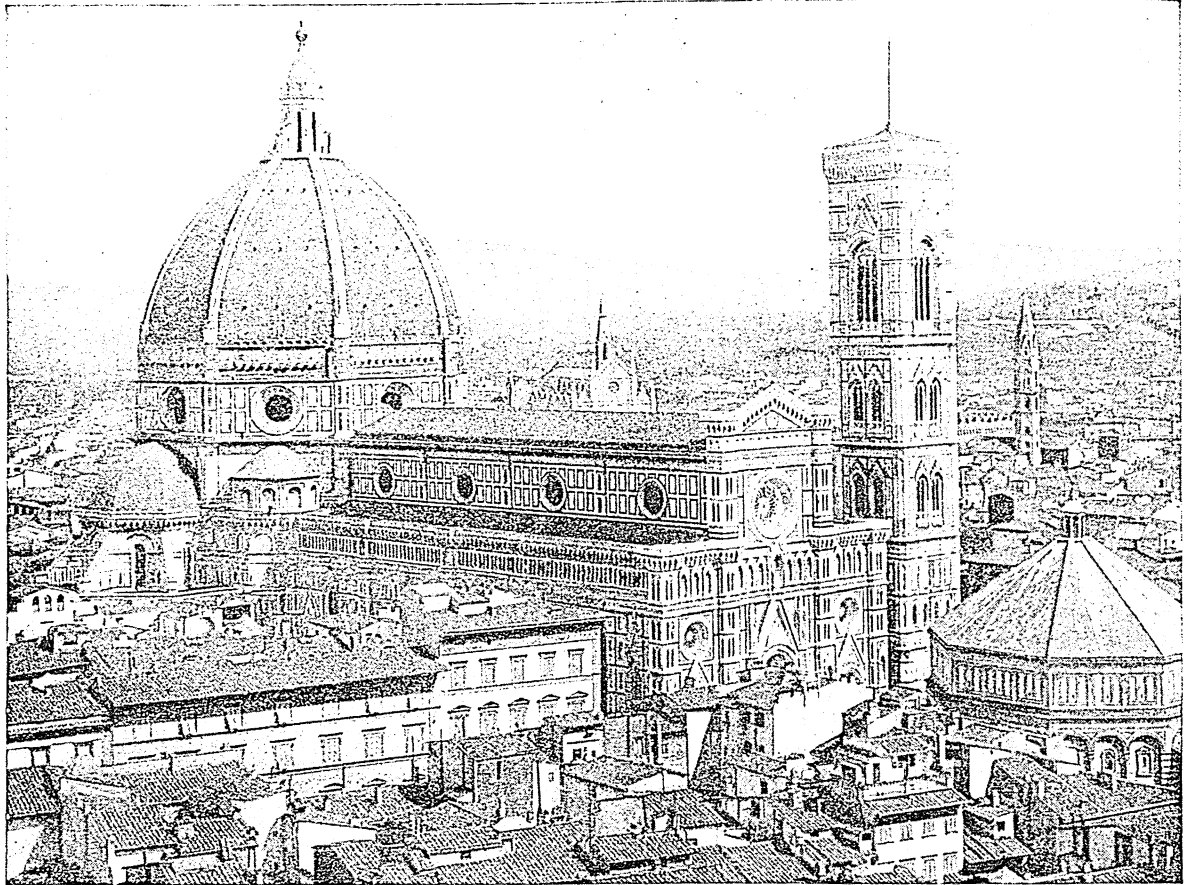
Troubled History of the City-State

Though there are traces of the city's existence as early as the 2d century B.C., its real career did not begin until the year 1115, when Florence became free from the margraves of Tuscany, who represented the German emperor. Almost immediately began the struggle for power between the Guelphs and the Ghibellines, partisans of pope and emperor, respectively. In 1215 members of the powerful noble family of the Uberti murdered a member of the Buondelmonti family, and started a factional war which lasted 50 years.

The Guelphs, aided by the pope, prevailed in the main until 1260, when their army was almost entirely annihilated at the town of Sienna and their leaders were forced to flee. Florence remained in Ghibelline hands until 1266, when Charles of Anjou, champion of the pope against the Hohenstaufen emperor Frederic II of Naples and Germany—"the wonder of the world"—came over from France and smashed the Hohenstaufen forces at the battle of Benevento. The Guelph exiles thereupon returned. Then in 1293 came the famous Ordinances of Justice excluding from office all persons (nobles usually) who were members of the gilds into which the Florentines were divided according to their trades and occupations. For about 150 years the city was then a republic, but with all power concentrated in the hands of the wealthier 5,000 of its 100,000 citizens.

Well might the Florentine historian Machiavelli say, in reviewing this troubled period: "At first the nobles were divided against each other, then the citizens against the nobles, and lastly the citizens against the populace; and it often happened that when one of these parties got the upper hand it split into two. And from these divisions there resulted

LOOKING ACROSS THE HEART OF FLORENCE



From the cupola of the Church of San Lorenzo we are looking southeastward over Florence. Immediately before us is the great Cathedral, upon which a succession of famous architects labored for nearly 200 years. The people of Florence voted to build it in 1294, and the work began. But 124 years later no architect had yet been found who would undertake the gigantic task of putting up the dome. A competition was held in which the genius of Filippo Brunelleschi obtained the victory. Fourteen years he took to build the cupola alone; and the lantern tower above, whose tip rises 300 feet from the street, was not completed until 1462. The famous Campanile or bell-tower next the cathedral was designed by Giotto. The low eight-sided structure at the right is the Baptistery, noted the world over for its bronze doors designed by Ghiberti.

so many deaths, so many banishments, so many destructions of families, as never befell in any other city of which we have record."

As a result the city gradually fell into the power of the trading and banking family of the Medici—not by force of arms, as in Milan and elsewhere, but by corruption and political management. Cosimo de' Medici (1389–1464), the first to take control, held no office or title, but—much like an American political "boss"—he ruled the city by the power of his wealth, his connections, and his personality. Under Lorenzo the Magnificent (1469–1492) the Medicean power and splendor reached its height. The 14th century was the age of Dante, Petrarch, and Boccaccio, the great period of Tuscan literature which shaped the modern Italian language, and the dawn of Renaissance art. Now classical learning was revived in all its branches, and every art and science flourished. Michelangelo, Leonardo da Vinci, Botticelli, are products of this wonderful period.

At the death of Lorenzo, Fra Girolamo Savonarola

began his crusade in Florence. Luxury had undermined the morals of the city and this Dominican friar undertook to reform it and restore the city republic. He was so successful at first that the Medici were expelled and many books and works of art were burned in public by the citizens. Savonarola was virtual ruler until he incurred the wrath of the pope and was excommunicated and burned in the Piazza della Signoria in 1498. (See Savonarola.)

Niccolo Machiavelli, the famous historian and statesman, lived in Florence during this period and wrote his celebrated work, 'The Prince'.

With the restoration of the Medici in 1530 Florence ceased to have a separate history. Its fortunes are merged with those of the Grand Duchy of Tuscany, which in 1743 passed to the Austrian House of Hapsburg. In 1859 the whole of Tuscany was annexed to the newly arisen kingdom of Italy. From 1865 until 1870, when Rome was recovered, Florence was the capital of the kingdom. Population today, about 320,000. (See Italy.)

The SOUTHERN FINGER Of the UNITED STATES



FLORIDA. Like a giant index finger, Florida extends south from the great mass of the United States, partly enclosing the Gulf of Mexico. With Cuba and the northward jutting peninsula of Yucatan, it forms a barrier which almost shuts off access to this great gulf. The peninsula ends in a westward curving chain of some 10,000 tiny coral islets and sandbanks, called the Florida Keys (*see* Key West).

Florida lies in approximately the same latitudes as Egypt. In many ways, however, it is comparable rather to Italy. Both are peninsulas, with mild winter climates tempered by the seas which nearly surround them. Both are world playgrounds. Sun-warmed beaches and luxurious hotels fringe their coasts. Beautiful inland lakes add to the enjoyment of pleasure seekers. But instead of purple mountains mantled with olive and chestnut groves, Florida has dark, mysterious mangrove and cypress swamps, and broad, flat prairies covered with grass and patches of palmetto. Italy boasts of its ancient cities and historic ruins. Most of Florida's cities are young, owing their development to the extension of the railroads in the 1880's; and many have sprung up since 1900 from

Extent.—North to south, 450 miles; east to west, from 400 to less than 100 miles. Area, 58,560 square miles (land, 54,262 square miles; water, 4,298 square miles). Population (1940 census), 1,897,414.

Natural Features.—Greatest elevation, 325 feet. About 30,000 lakes (the largest, Lake Okeechobee, 700 square miles in area). Everglades, cypress, and mangrove swamps. Silver, Rainbow, Itche-tucknee, Wakulla Springs. St. Johns, Kissimmee, Suwannee, and Apalachicola rivers. Coast line of 3,751 miles (longest in United States). Mean annual temperature, 71°; mean annual precipitation, 53".

Products.—Oranges, grapefruit, corn, potatoes, sugar cane, peanuts, cotton, pecans, tobacco, vegetables; poultry, cattle, hogs; shrimp, oysters, fish, sponges; phosphate rock, limestone, fuller's earth; lumber, turpentine, rosin, fertilizer, canned and dried fruits and vegetables, paper, cigars.

Cities.—Jacksonville (173,065), Miami (172,172), Tampa (108,391), St. Petersburg (60,812), Pensacola (37,449), Orlando (36,736), West Palm Beach, Miami Beach, Daytona Beach, Lakeland, Fort Lauderdale, Tallahassee (capital) (all over 15,000).

swamp and coral rock and sand bar. Yet Florida is not a young state.

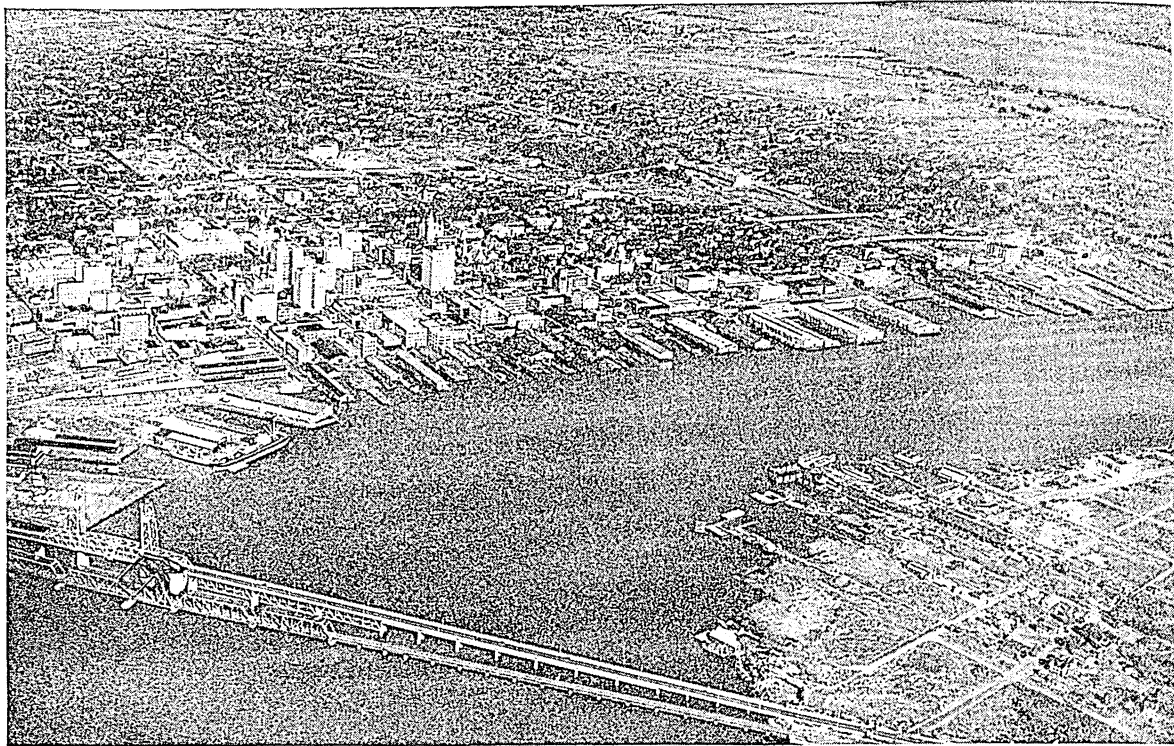
More than 400 years ago, on Easter Sunday (called in Spanish *Pascua Florida*), Ponce de Leon, seeking the fabled "Fountain of Youth," sighted the Florida coast. A few days later he landed near the mouth of the St. Johns River (1513). He claimed

the territory for Spain, and named it either in honor of the day of its discovery, or from the abundant flowers (Spanish *florida*, "flowery") which he found growing everywhere. (*See* Ponce de Leon.)

Ill-fated Venture of Narvaez

More than a decade later, Charles V of Spain granted a large tract of this new land to a favorite, Pánfilo de Narvaez, another Spanish explorer. After a hazardous voyage on which a third of his men lost their lives, he reached Florida in 1528. For months the explorers tramped through forests and treacherous swamps. They came out at the present site of Pensacola, and waited for supply ships, which failed to find them. In the hope of reaching their countrymen in Mexico, they constructed boats and sailed away. But only a few ever saw their destination, for a gulf storm destroyed Narvaez and most of his men.

AN AIRMAN'S VIEW OF BUSY JACKSONVILLE



Though Jacksonville is 28 miles from the ocean, it is an important seaport, as the impressive array of wharves indicates. This picture shows the city from the south, as it appears when one flies up the St. Johns River from central Florida. Below us we see how the river turns east past the principal business district, then north again, on its way to the sea.

Shortly thereafter, Charles V appointed Hernando de Soto governor of the new province, and in 1539 this daring explorer sailed into Tampa Bay with 700 men. From here he set out on his epoch-making expedition, in the course of which he marched northward through the Florida wilderness into Georgia and Alabama to the Mississippi River (*see* De Soto, Hernando). He dreamed of finding the fabled riches of "El Dorado" and of eclipsing the achievements of Cortez in Mexico and Pizarro in Peru.

Spaniards and Huguenots Wage Wars

Spain alone gambled for the hidden gold of Florida until the French Huguenots sought a haven there from religious persecution. Led by Jean Ribaut, they landed at the mouth of St. Johns River in 1562 and unfurled the French flag. Another group of Huguenots followed and built Fort Caroline on the banks of the St. Johns. The Spanish resented their presence; and when Pedro Menendez de Aviles arrived in 1565 with 19 ships and 1,500 men, he captured Fort Caroline, and killed nearly all the colonists, as he said, "not as Frenchmen, but as heretics" (*see* Coligny). Menendez two weeks earlier had founded St. Augustine, the first permanent settlement in the territory. He also explored part of the eastern coast, and built forts at San Mateo, Avista, Gual, and St. Helena.

To revenge the death of Ribaut and the French Huguenots, Dominique de Gourgues captured Fort San Mateo in 1568, hanged the Spanish colonists, and

left this inscription on a pine slab: "I do this not as unto Spaniards but as to traitors, robbers, and murderers."

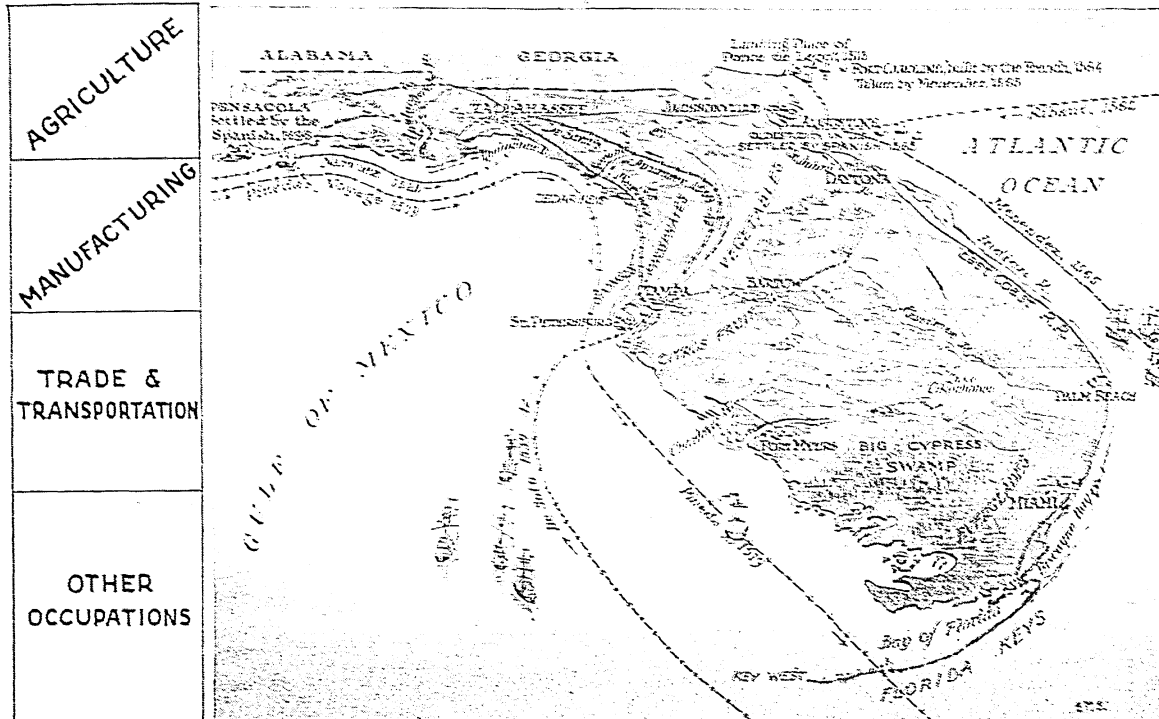
Sir Francis Drake and his band of adventurers plundered and burned St. Augustine in 1586. Eighty years later, John Davis and his bold English buccaneers again destroyed this settlement (*see* St. Augustine).

St. Augustine and the few forts on the eastern coast represented all of Spain's efforts to colonize Florida until 1696, when Pensacola was founded. Quarrels during the next 150 years between the Spaniards and the English colonists in the Carolinas and Georgia were ended by a treaty agreement in 1763, whereby Spain gave up Florida to England and received Havana. Under British rule Florida prospered, and in 20 years had 25,000 white inhabitants. However, during the American Revolution, Spain declared war, sent an expedition to Florida, and forced England to cede Florida back to Spain in 1783.

United States Gets Territory from Spain

During the next 25 years, the United States carried on a dispute with Spain over boundary lines in West Florida. It was ended in 1819, when Spain ceded to the United States not only the land in question, but also East Florida. In 1822 Florida was admitted as a territory. The Seminole Indians were forced to take land in the West at the conclusion of bitter warfare during 1835-42. Florida entered the Union as a state

FLORIDA'S ROMANTIC STORY, IN PAST AND PRESENT TIMES



In this bird's-eye view of Florida and the "graphs" below and on the left above are presented some of the most striking facts about the products of the state, its physical characteristics, its history, and the relative number of persons employed in the chief occupations. In the bird's-eye view the arrow on the horizon to the right shows where Ponce de Leon landed shortly after Easter day on "The Island of Eternal Youth," as he thought. Sailing part way around the peninsula as he did later, he supposed he was exploring an immense island and returned to Spain with a report to that effect. In 1519 came Pineda's voyage and in 1528 that of Narvaez, who in the course of his explorations landed at the present site of Pensacola and stayed there for six months, suffering from exposure, hunger, and Indian attacks. He later lost his life in a storm near Pensacola Bay. Between 1539 and 1542 the land was partially explored by De Soto. In 1562 Ribaut, with a band of French Huguenots, landed on the east coast and claimed the country on behalf of France, but three years later the Spaniard Menendez captured Fort Caroline, put almost the entire garrison to death, and founded the city of St. Augustine, which remains today the oldest city in the United States. Their hardships contrast strangely with the ease of travel between the luxurious resorts of today, some of which are indicated.

in 1845, and seceded only a few years later, in 1861.

Florida's potential wealth was scarcely touched until 1875, when it was discovered that oranges could be grown profitably in the semi-tropical belt across the middle of the state. Next a market developed for grapefruit, grown in the southern part of the state. Today oranges and grapefruit provide by far the greatest part of Florida's agricultural wealth. The state produces about one-half of the country's grapefruit, and about 30 per cent of its oranges.

Next it was found that pineapples could be raised in abundance along the east coast, from a few miles north of Palm Beach to the Keys at the southern tip of the peninsula. Now Florida is a paradise of strange exotic fruits, many of which find their way to northern markets. One of the most popular is the dark green avocado or alligator pear, native to Mexico and Central and South America.

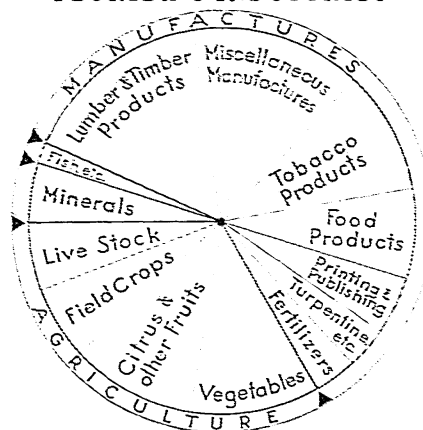
Long before civilization crept into the Florida wilderness, the tamarind, probably an immigrant from the West Indies, grew there. Tall mango trees, natives of

India, shade the streets and yield a popular lush melon-shaped fruit. Other favorites in Florida orchards are the papaya, tangerine, guava, kumquat, and the pretty Japanese loquat.

Corn, potatoes, and sugar cane rank next to the citrus fruits as the most valuable of Florida's agricultural products. Sweet potatoes, peanuts, tobacco, cotton, rice, and berries add to the state's wealth. Between November 15 and July 1, truck farmers of the state ship thousands of carloads of vegetables to northern centers, where they are marketed fresh

in competition with the greenhouse products of the colder sections. Among the important ones are tomatoes, celery, cabbage, cauliflower, lettuce, onions, eggplant, peas, peppers, spinach, and radishes.

FLORIDA'S INDUSTRIES



FRUITS OF FLORIDA'S LAND AND SEA



In all, the state ships annually nearly 100,000 cars of orchard and garden crops, more than ten per cent of the total of such shipments in the United States.

About 1889 Florida realized the value of its phosphate rock, lying in the belt from north of Dunnellon to south of Tampa on the west coast. This industry has grown until the state produces about seven-eighths of the phosphate supply of the United States. Its deposits of fuller's earth are the best in the country.

Other sources of Florida's wealth are timber (yellow pine and cypress), lumber, turpentine, rosin, tar, live stock, nursery plants, and tung-oil.

Florida is not an important manufacturing state, yet the value of its manufactures totals well over \$260,000,000 in a normal year. The production of lumber and timber, including planing mills output, is the leading industry; cigar and cigarette factories rank next in the size of their payrolls and output.

Fisheries Add to Wealth

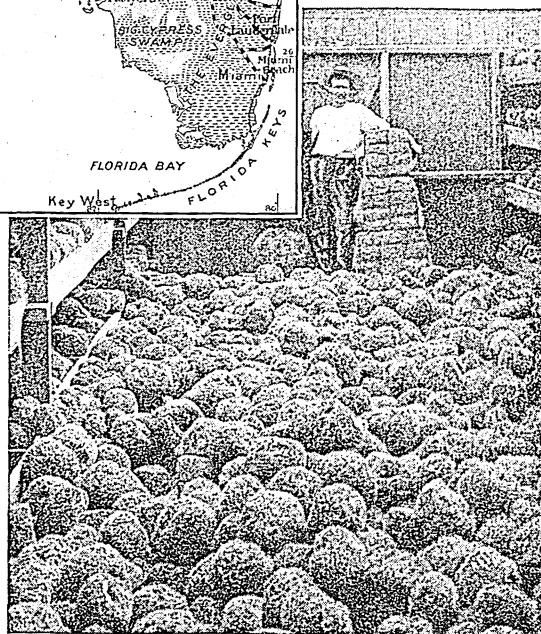
More than 500 species of fish inhabit the extensive coastal waters of the state. Shrimp, Spanish mackerel, mullet, shad, oysters, clams, terrapin, green turtles, trout, red-snappers, pompano, and sheepshead are among the species of commercial value. Silver-scaled tarpon and other large fish lure sportsmen.

Sponge products of this "American Mediterranean" now exceed those of Europe; and the largest sponge fisheries of the world make Tarpon Springs their port and market headquarters.

The demand for alligator skin handbags, shoes, belts, and similar articles has so nearly exhausted the supply of alligators in native haunts that large farms for raising them have been established in Florida.

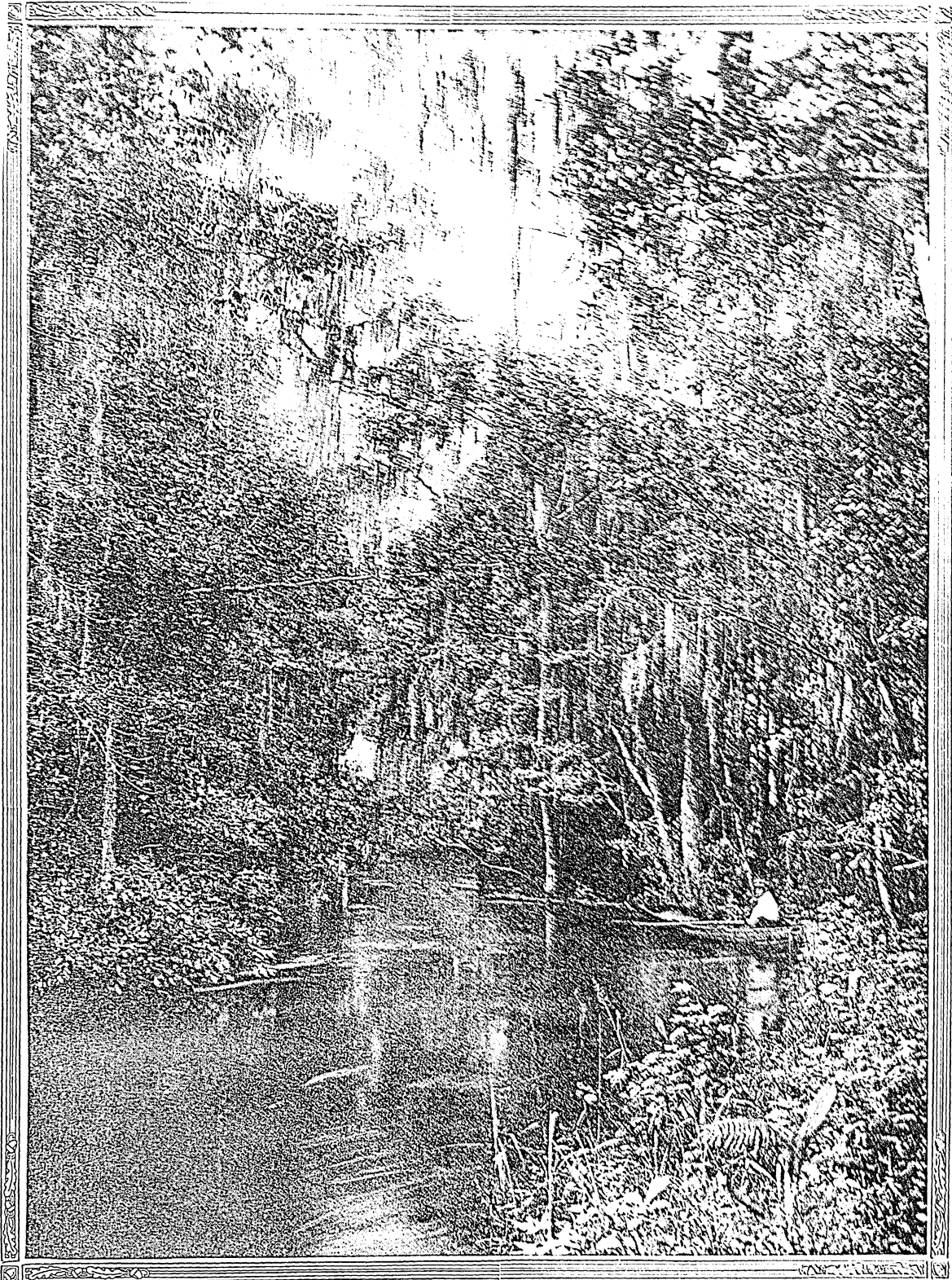
Florida's greatest attraction for residents of other states is its delightful winter climate. The Gulf Stream, flowing from the Gulf of Mexico between Cuba and Key West and fringing the eastern coast,

moderates the climate for most of the peninsula. On the western coast, the Gulf of Mexico has a similar influence. Mean winter temperatures range from 50° F. in the north to about 70° in the south; and, although the state lies between the same parallels of latitude as the northern part of the hot Sahara, summer temperatures average only slightly over 80° F. through-



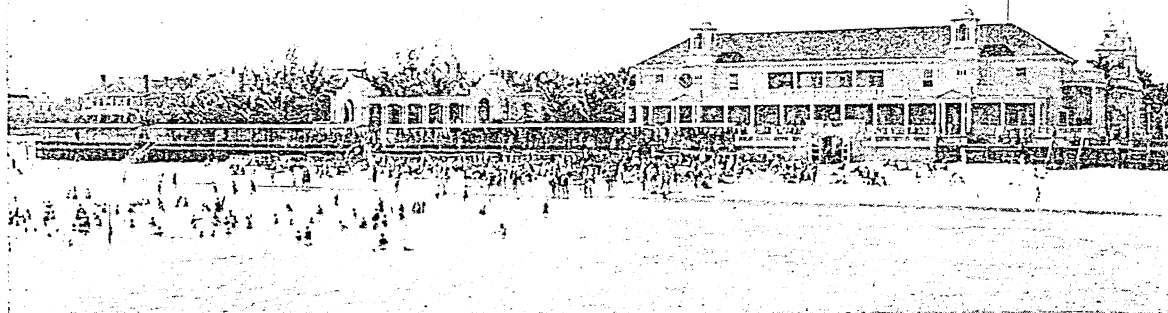
At top and bottom are shown two picturesque products of Florida: delicious grapefruit, and sponges from the sea, both of which this state produces in large quantities. The map shows the railroad lines and principal cities of the state, whose climate draws thousands of visitors.

IN THE LAND OF THE EVERGLADES



Most of the Everglades is a vast swamp, thickly overgrown with marsh sawgrass, from which also scattered islands or "hammocks" covered with oak, pine, cypress, and palm. Parts of the 'glades, however, are semitropical jungles, as in this picture. Sluggish bayous wind through forests draped in Spanish moss. Giant orchids accent with their beauty the somber depths of the swamp. Alligators and even crocodiles infest the waters. Wild animals live here, and rare birds found nowhere else on the continent.

WHERE WINTER NEVER COMES—SURF-BATHING IN FEBRUARY



This midwinter bathing scene at Palm Beach shows one of the reasons why Florida is one of America's winter playgrounds. Many miles of beaches like this line the Atlantic and Gulf coasts, where the climate is so mild that ocean bathing is pleasant in any month.

out the state. The rainy season comes in June, July, and August, but the winters are comparatively dry. Such ideal conditions attracted more and more winter visitors as Florida developed as a pleasure resort.

Lack of transportation at first handicapped Florida as a resort state; but this was overcome largely by the efforts of two men—H. B. Plant, who from 1879 to 1899 developed the Plant system of railroads (now the Atlantic Coast Line) focusing upon Tampa, and Henry M. Flagler, who from 1885 to 1912 developed the Florida East Coast Railway. The latter line extends south from Jacksonville along the eastern coast. These, with the Seaboard Air Line and a network of smaller lines, penetrate the rich fruit and vegetable districts of central Florida. The prosperity of east coast resorts, such as Ormond Beach, Daytona Beach, Palm Beach, and Miami, followed soon after the railroads.

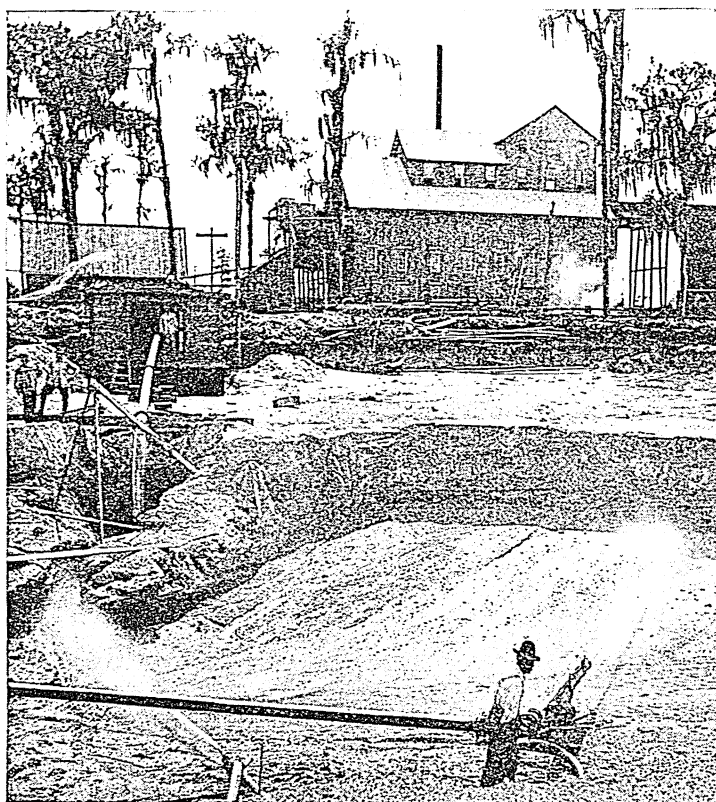
Plant and Flagler also built luxurious hotels to attract tourists to their respective zones of activity. Plant likewise established steamship lines and developed port facilities at Tampa.

Inland waterways have been improved. The Florida Intracoastal Waterway provides sheltered passage down the east coast from Cumberland Sound south to Miami. And rivers and lakes have been linked by canals to provide a cross-state route between St. Lucie Inlet and Fort Myers.

A great impetus to Florida's growth came after the World War. In 1924, the state passed a constitutional amendment prohibiting state income and inheritance taxes. National attention was turned to Florida and its advantages, and the result was an extraordinary "land rush" or "boom" which drew thousands of people to the state. The roads were thick with automobiles hurrying southward; the railroads were swamped with traffic; real estate soared in price. Whole towns were built upon what was once swamp or forest land, and sand was pumped from the ocean upon low-lying shores for

additional home sites in the most popular locations. When Florida took its 1925 census during this boom, many cities and towns had more than doubled in population since 1920, and the state had gained 30.4 per cent.

ONE OF THE FLORIDA PHOSPHATE BEDS



The phosphate rocks of Florida are deposited in veins near the surface and are found in the form of soft phosphate, a whitish product that looks a good deal like clay and has a good deal of clay mixed with it. Phosphate of this character is mined by hydraulic process, as you see from the picture. The deposit in Florida forms a crescent-shaped belt running along the west coast.

Florida abounds in birds and other wild creatures, many of which are remarkable for their beautiful color or strange form. The huge manatee or sea-cow basks in the warm coastal waters of southern Florida. This tropical mammal, which sometimes weighs more than a ton, was formerly common along the Florida coast, but is increasingly difficult to see.

Small numbers of pumas or cougars still lurk in the wilder parts of south Florida and in the swamps bordering the Everglades, and a few black bears survive in the densest swamps. Deer, otter, and raccoon are numerous. Crocodiles and alligators inhabit the water. All year man-o'-war birds sail gracefully along the seashore. Clownish brown pelicans, permanent Florida residents, engage in magnificent aerial drills or busy themselves diving for menhaden. Cackling coots and purple gallinules crowd ponds and lakes, and the wailing of limpkins gives a weird charm to the swamps. In south-central Florida the trumpeting of sandhill cranes still resounds across the prairies, although these huge birds have disappeared from many other parts of the United States. In southern Florida the Everglade kite sails low over shallow lakes and streams in search of fresh-water snails; here, too, large numbers of great white herons stand knee-deep in water. The greatest thrill, however, comes to the bird student when he glimpses the rare roseate spoonbill, which remains only in the southern tip of Florida.

The "Singing Tower"

To give refuge to Florida's birds and to provide a retreat of repose and natural beauty for man, Edward Bok in 1929 gave to the American people Mountain Lake Sanctuary, with its beautiful Singing Tower. This preserve occupies 48 acres of land, including Mountain Lake and Iron Mountain, the highest point of land in Florida, in the center of the state, somewhat east of Lakeland. The Singing Tower is a symphony in pink marble and coquina rock rising 205 feet from the edge of a clear pool and tapering gradually from its 51-foot gray creole marble base to

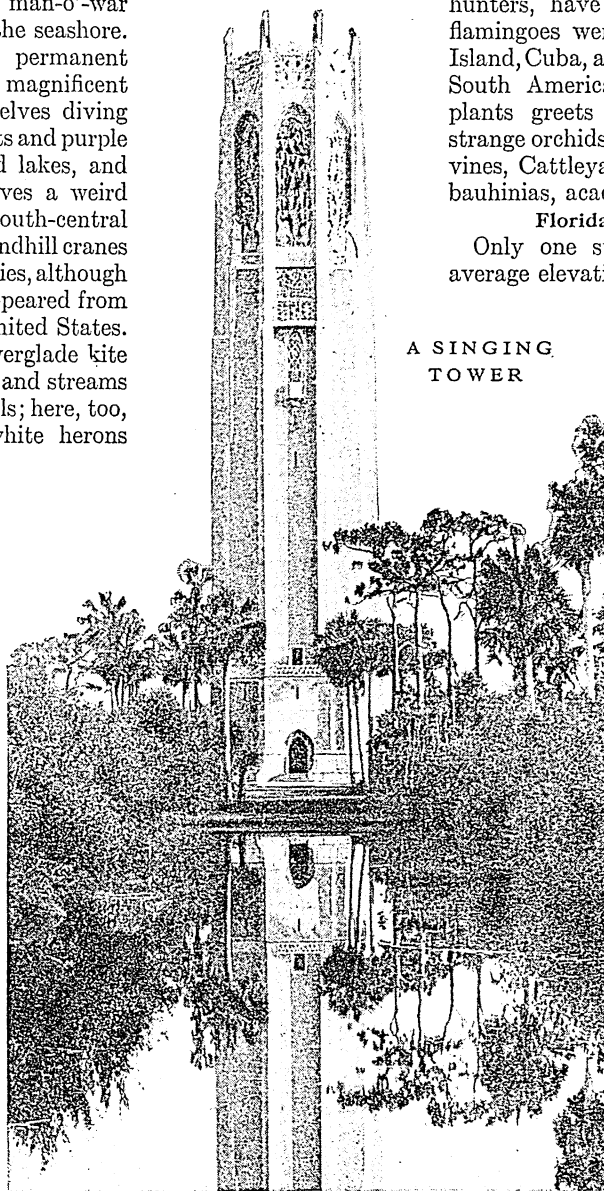
a width of 37 feet at the top. Pelicans, doves, eagles, herons, and other birds typical of America appear in the carvings. Panels designed with roses and palms crown the octagonal summit, and a heron perches on each of the eight buttresses. Near the very top of the tower is the carillon, consisting of 71 bells weighing 123,264 pounds, and cast in an alloy of the finest copper and English tin.

To make the surroundings more beautiful, birds and rare plants have been brought to the sanctuary. Nightingales came from England, flamingoes, common in Florida but driven out by plume hunters, have been imported. Scarlet flamingoes were brought from Andros Island, Cuba, and white flamingoes from South America. A medley of foreign plants greets the visiting botanist—strange orchids from tropical Asia, flame vines, Cattleya, guava, duranta, white bauhinias, acacias, and many others.

Florida's Physiography

Only one state, Louisiana, has an average elevation above sea level lower than that of Florida, yet there is considerable diversity in topography. Limestone rock underlies the soil, which is basically sand patched with the comparatively thin vegetable mold of the pine lands and the thick peat-like muck of the swamps. Rolling hills, 200 to 300 feet above sea level, prevail over northern Florida. A ridge running north and south divides the east coast river systems from those of the western coast. Innumerable lakes and ponds, especially in the central portion of the peninsula, fill the troughs between ridges and plateaus. Many of the more than 30,000 lakes in the state owe their origin to the soluble limestone underneath them; others fill depressions in the floor of the sea that once covered the coastal terraces.

Lake Okeechobee, the second largest body of fresh water that lies



At Florida's highest point, Mountain Lake, the late Edward W. Bok built this 205-foot column of Georgia marble and native stone to bring the singing towers of his native Holland to America. Its carillon of 71 clear-voiced bells serenades the sunset in harmony with the vespers notes of the bright birds in whose sanctuary it stands.

wholly within the United States, occupies an old sea bottom on the northern border of the Everglades. Other lakes, such as Lake Poinsett, at the head of the St. Johns River, are probably remnants of coastal lagoons, like Indian River and Lake Worth on the eastern coast. Surface waters, saturated with carbonic acid from decaying organic matter, have etched great subterranean drainage channels in the limestone formations, and have given rise to thousands of springs. The largest of these is Silver Springs, at the head of beautiful Oklawaha River. This spring discharges about 370,000 gallons a minute, and ranks as one of the largest springs in the country.

One of the numerous river systems, the St. Johns, flows north parallel with the eastern coast for 300 miles before it drains into the Atlantic near Jacksonville. Draining into the Gulf of Mexico are the Suwanee, which rises in Georgia, and the Apalachicola, a continuation of the Chattahoochee River.

Swamps are common in many parts of the peninsula. The beautiful Okefenokee Swamp extends into northern Florida from Georgia. Sloping southward from Lake Okeechobee are the Everglades, a vast flooded prairie about 110 miles long and 45 miles wide. Part of this region is densely forested, but most of it is thick, spongy, water-soaked muck covered with clumps of saw grass. The northern part of the Everglades is being reclaimed by the state and the Federal government. In 1906 construction began on a series of canals draining from Lake Okeechobee to the ocean, and now thousands of acres of rich land yield citrus fruits, vegetables, sugar cane, rice, and other crops.

Everglades National Park

The southern part of the region, covering about 2,300 square miles, is to become the Everglades National Park as soon as the lands have been acquired by the national government. The new park was authorized in 1934. Parts of this primitive wilderness have never been explored. On the west the open, island-studded prairies merge into the Big Cypress Swamp, which is crowded with the giant relatives of the famous California sequoias. In Royal Palm State Park, which will merge with the national park, is the finest stand of royal palms in the country. The southernmost point of the park is Cape Sable, 350 miles farther south than Cairo, Egypt. Here mangrove trees from 60 to 100 feet high rise like cliffs out of the Gulf of Mexico. In this fantastic region huge sea turtles come ashore to hatch their eggs, and at low tide oysters may be seen clinging to the trunks of the mangroves.

Forests of mahogany and wild fig, *lignum vitae*, and rubber, interlaced with strong trailing vines and 18 species of air plants, form an almost impenetrable barrier. Twenty-five varieties of orchids have been discovered, some plants bearing as many as 1,000 flowers and estimated to be 500 years old. With Seminole Indians as guides you may travel for hundreds of miles through a maze of waterways to study

the rare birds, fish, and animals which have taken refuge in these wilds.

A few Indians and whites live in this tangle of streams and lagoons. After the close of the Seminole War in 1842, a few hundred members of the tribe escaped removal to reservations west of the Mississippi by fleeing to the inaccessible heart of the Everglades. Here they have lived ever since, poling their boats through the dense saw grass, hunting deer and other game, fishing, and tilling little plots of the rich island soil. Although the Seminoles (whose name means "runaway" or "seceder") mix with the black race, they steadfastly refuse to mingle with the whites and still retain most of their primitive customs through their inaccessibility and their strict tribal laws.

Florida's Leading Cities

Jacksonville is the northern industrial center of Florida. St. Augustine is the oldest city in the United States. Tallahassee, the capital, in the northern corner of the state, is a shipping point for fruit, tobacco, cotton, and corn, and has some busy industrial plants. Orlando and Lakeland are centers of rich fruit-growing districts. Palm Beach, the resort of fashion, and Miami, a mecca for winter tourists and an important grapefruit and truck garden center, are on the southeast coast. Pensacola, the second oldest city in the state, has the finest harbor on the Gulf of Mexico. A naval air-training station is situated there. Tampa is the most important commercial city on the Florida Gulf coast. St. Petersburg, the "Sunshine City," on the west coast, is one of the country's great salt-water fishing resorts. Key West, long known as a cigar-making center, is now more important as a winter resort and as the country's closest link with Cuba, which is only about 100 miles across Florida Strait. (See Jacksonville; Key West; Miami; St. Augustine; Tampa.)

Education and Government

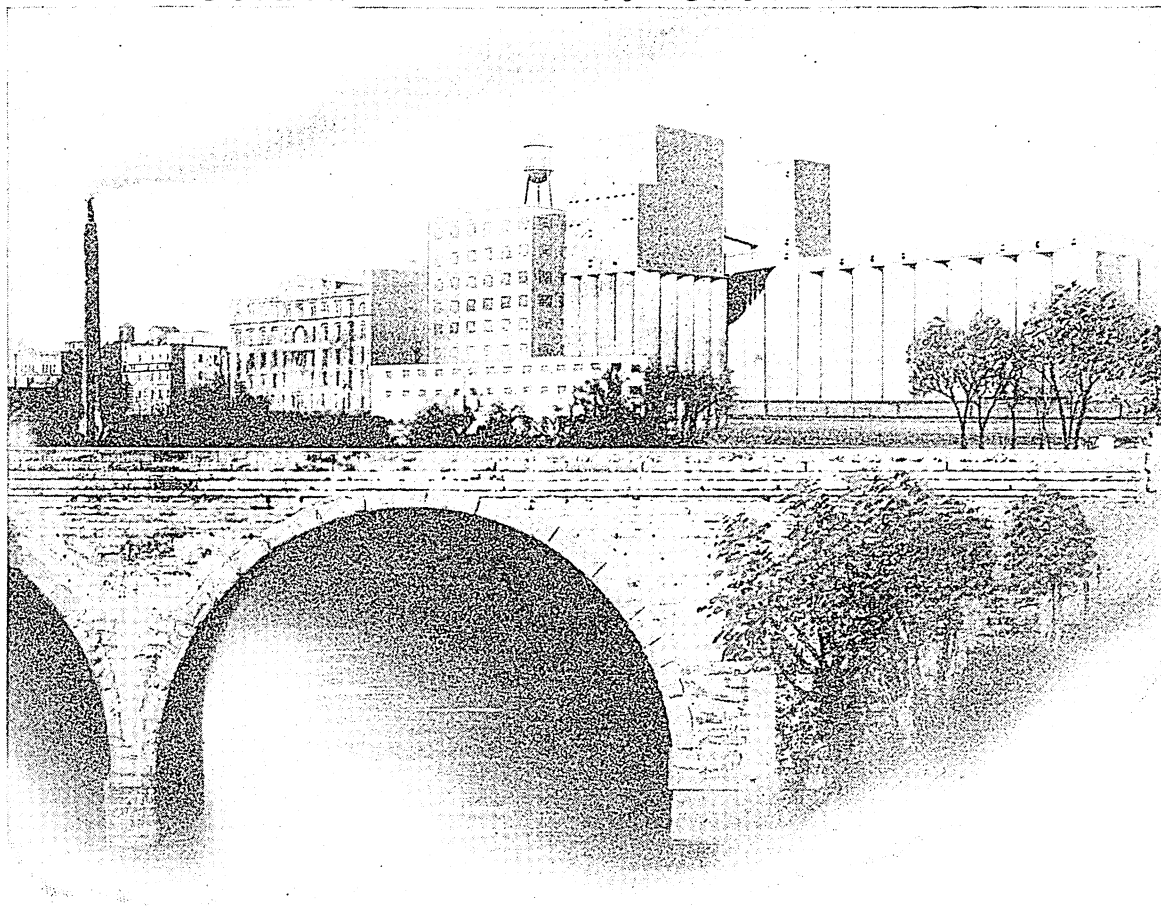
The University of Florida is at Gainesville. Other important institutions of higher education are the Florida State College for Women at Tallahassee; Southern College, a Methodist institution at Lakeland; the John B. Stetson University, a coeducational Baptist university at Deland; Rollins College, famous for its original and unconventional methods, at Winter Park; the University of Miami at Coral Gables; and the University of Tampa at Tampa. Institutions for the higher education of Negroes include the Florida Agricultural and Mechanical College for Negroes at Tallahassee and the Bethune-Cookman College at Daytona Beach. There is a school for the deaf, dumb, and blind (founded in 1885) at St. Augustine.

Florida's present constitution was adopted in 1886. The state executive officers are governor, secretary of state, attorney general, comptroller, treasurer, and others. The governor, who is elected for a four-year term, is not eligible to serve two consecutive terms. The senate, with 38 members elected for four years, and a house of representatives, with 95 members elected for two years, make up the legislature.

FLOUNDER. The name given to a number of food-fishes of the flatfish group, totaling about 500 species. The "summer flounder" or plaice (*Paralichthys dentatus*) is most abundant in the shallow sandy bottoms about Long Island; it may reach a weight of 15 pounds, but is usually much smaller. The "winter

flounder" (*Pseudopleuronectes americanus*), found from Chesapeake Bay to Labrador, is about half the size of the summer flounder. Other well-known species are the "four-spotted flounder"; and the "diamond flounder" and "starry flounder," common species of the Pacific coast. (See Flatfish.)

FROM *Golden WHEAT* to *Snow-White* FLOUR



This is one of the great flour mills at Minneapolis, with the Mississippi River in the foreground. Those immense concrete cylinders on the right are the bins of the grain elevator, in which wheat is stored until it is needed for grinding. The different bins hold the different kinds of wheat used in making various blends of flour. Such huge combinations of elevators and mills are to be seen in most American milling centers.

FLOUR AND FLOUR-MILLING. The golden wheat as it comes from the fields must be changed into flour before bread, our principal article of food, can be made from it. The process of grinding the kernels into flour and separating the fine flour from the coarser portions is called "milling."

In early times a stone was hollowed out and a smaller stone, with one end rounded, was used to pound the grain into bits, which were mixed with water and baked on a hot stone (*see* Bread and Baking). Later a hand-mill called a "quern" was used. This consisted of two disks of stone, one on top of the other, with a hole in the middle, through which the

grain was fed in. The upper stone was rotated on the lower by means of a handle. Next came large mills made on the same plan, with stones with grooved surfaces to give a cutting edge, and turned by oxen or water power or windmills. Such mills as these formed part of every great feudal estate in the Middle Ages, and to them the villagers had to go to grind their grist, paying their lord a fee for the privilege. In the early days of the United States boys often rode long distances, perched atop a bag of grain on horseback, to some pioneer mill where the family flour or meal was ground. This system of milling can still be found in primitive communities.

The "roller process," by which nearly all grain is ground today, was brought in from Hungary in 1870 to grind the hard wheats then being introduced in the West. The new process was needed because millstone grinding cannot make white flour from hard wheat. Steel rollers with grooved surfaces squeeze the flour from the wheat berries as they turn against each other, but leave the germ and husk large enough to be separated easily. Thus the "patent" roller process flour of today is whiter than the stone-ground flour of our grandfathers.

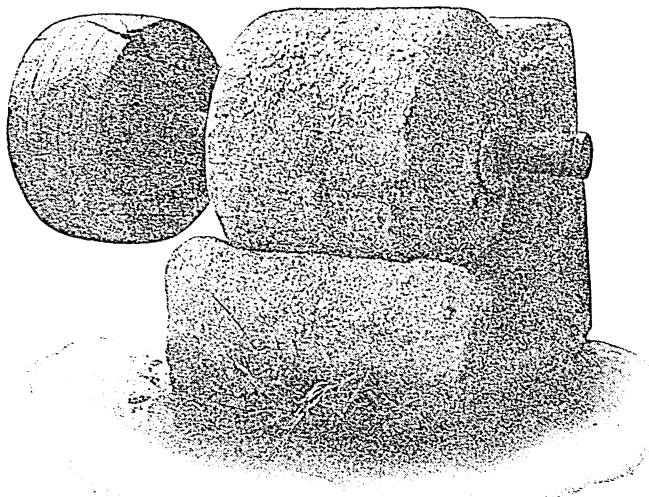
The word flour by itself ordinarily means wheat flour. Other flours are named for the cereals from which they are made, as rice flour, rye flour, etc. Wheat flour contains gluten, a substance which does not occur to the same extent in other cereal grains. It is this which makes dough sticky and elastic, so that it will retain the bubbles

of gas formed by yeast or baking powder and thus rise and become light.

Before we can fully understand milling we must

know just how a grain of wheat is made up. We all know that it is an oblong little grain with a furrow down one side. On the outside is the brownish husk, called bran, consisting of layers of woody fiber. Within this husk lies the white kernel, composed chiefly of gluten and starch, from which white flour is made. Tucked away in one end of this kernel is the wheat heart or seed-germ, which, if the grain were planted, would produce the new plant. In

IT GROUND THE GRIST OF OTHER DAYS



This is what is left of a granite flour mill which is at least 300 years old. The wooden pulley was turned by a belt driven by a water wheel. The grinder was originally supported by a wooden frame and the grain was crushed between the two stones.

the milling, the bran and most of the seed-germ must be removed from the starchy white kernel in order to obtain a fine white flour.

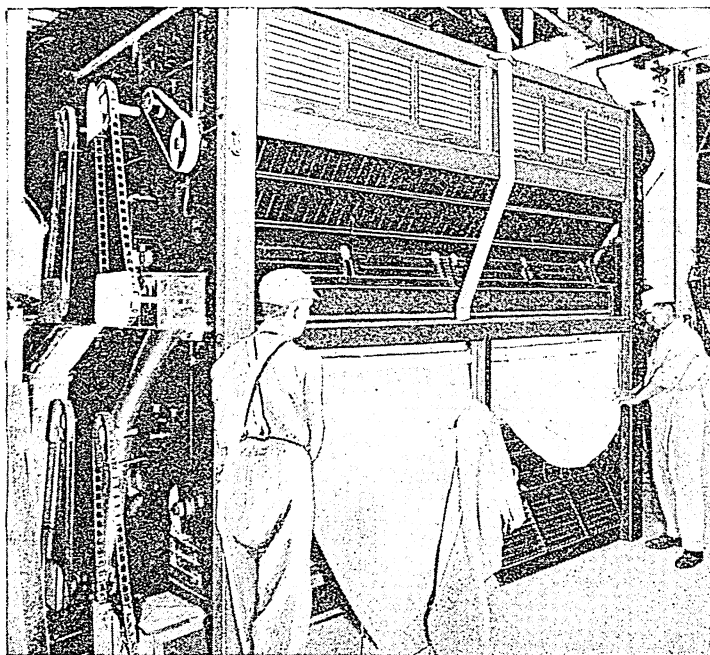
Let us see how flour is prepared in the big modern mills. These are usually eight or nine stories high,

and are so arranged that one part of the process is done on one floor and the next on the floor just beneath, so that gravity can be used to convey the grain from one machine to the other.

When the grain first comes to the mill it may contain dirt, particles of straw, and other seeds. These must all be removed before the grinding begins. This is done by sifting and shaking the grain and fanning it with strong currents of air. A special machine removes cockle-burs. The wheat grains are scoured bright and clean in a rapidly whirling cylinder. Then they are moistened with water or steam to toughen the coats of bran, so that when the grains are crushed these coats may more easily be separated from the flour.

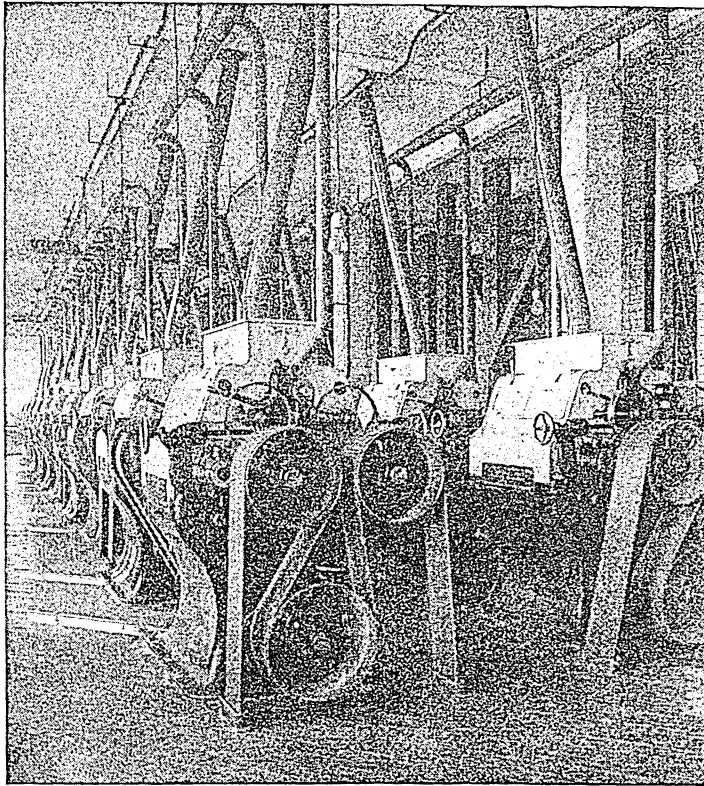
Some time now elapses while the grain is getting into condition for the next processes. When it is in the proper condition, it passes to what is known as the first break roll. This is a roller having coarse corrugations somewhat like saw teeth, and it opens up each grain, as a preparation for the passage through the purifying and bolting systems which

ATTACHING A NEW BOLTING CLOTH



Here we are inside a great modern mill. The men are attaching a new silk bolting cloth to the revolving cylinder of a reel. This cloth acts as a sieve in separating the fine flour from the coarser bits of the grain.

THESE ARE THE BREAK ROLLS



The task of these rollers is to break the shell of the grains, after which they pass on through several other sets of rolls, each adjusted to grind the grain a little finer than its predecessor.

come next. These processes consist of passing the wheat grains through sets of break rolls, each of which grinds a little finer than its predecessor. This gradual grinding works the flour loose without breaking the tough bran coats and the germ into too small pieces. They are kept comparatively large so that they will not pass through the bolting cloths with the flour.

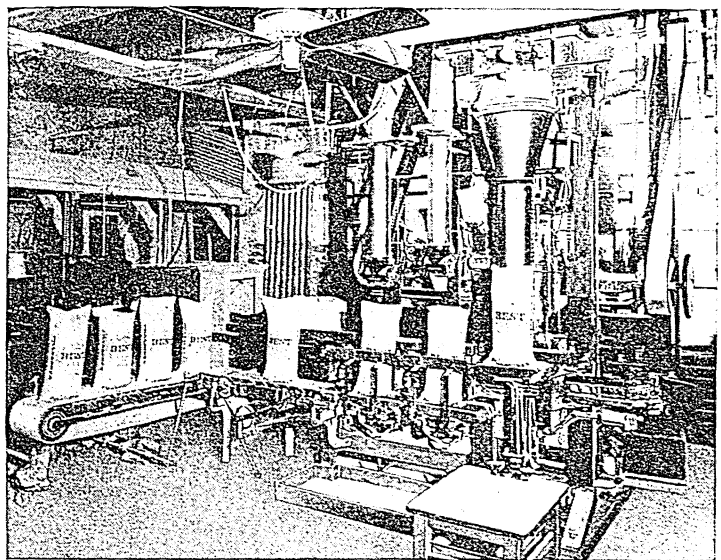
At each "break" part of the wheat is reduced to fine white flour and part still remains in comparatively large granular bits. The fine flour is separated by "bolting," that is, by passing it through very fine sieves of specially made silk. The "middlings," or the larger bits of the kernels, are then separated from the "tailings" (the bran and other rejected parts of the wheat), and passed on to another set of rollers to be further reduced. This process is repeated over and over, until all the wheat in process has been reduced to flour or its by-products. The last machine feeds the flour into containers, ready to go to the bakery or the grocery store.

Whole wheat or graham flour (named after Sylvester Graham) contains all the cleaned grain. When the bran and the germ are removed to make white flour, an excellent source of iron and the vitamins thiamin, riboflavin, and nicotinic acid is lost. Millers therefore agreed in 1940 to "enrich" their flours by adding certain amounts of these substances. (See Bread and Baking.)

White flours usually are classified as "straights," "patents," and "clear." Straight flour contains about 70 per cent of the berry. Patent flours are even more refined, and sometimes contain as little as 56 per cent of the berry. These highly refined patent flours are the favorites in America for home and commercial bakery use. The lowest grade of flour is known to the trade as "red dog," and is used chiefly in stock feeds and to make dog biscuits. "Shorts" is the name given to fine bran mixed with some of the floury portion of the wheat kernel. This grade also is used in animal feeds. For the finest patent flour, about 25 per cent of the lower grade is extracted; the extracted flour is called "clear"; much of it goes into the flour exported to Europe.

United States government figures show that modern milling averages one 196-pound barrel of flour from every 4.6

THE MACHINE THAT SACKS THE FLOUR



When the process of converting the wheat into flour is completed, the job of putting the finished product into the sacks is turned over to the flour packing machines, one of which is here shown. This machine automatically weighs the flour, putting the exact amount required into each sack. And it doesn't even stop there. It sews up the sacks "flour tight"!

bushels of wheat. Since flour contains about 72 per cent of the berry, one 60-pound bushel of wheat will yield about 43 pounds of flour. About 13 ounces of flour are needed to make a one-pound loaf of bread. Yearly per capita consumption of flour has fallen from about 175 pounds in the early 1920's to about 155 pounds at the present time.

Flour is milled throughout the United States at convenient points along transportation routes between areas of greatest supply and demand. Minneapolis is

such a point. It has the additional advantage of cheap power from the Falls of St. Anthony and was for many years the greatest milling center in the country. But in 1930 Buffalo passed Minneapolis and has since held first place. Low shipping rates on the Great Lakes, nearness to consumer markets, and the opportunity to mill Canada's export wheat in bond, besides cheap power, have made Buffalo the chief producer. Kansas City (the twin cities of Missouri and Kansas together) is third.

"FLOWERS *that their* GAY WARDROBE WEAR"



FLOWERS. The brightly colored parts of the flower are usually the "petals"; and it is their business to send forth the color call to their pollen carriers. Many flowers have still another call for help, and that is odor, which we call "fragrance" if it is pleasant to us. Not only have color and fragrance been developed by this partnership, but also the shapes of flowers have

been modified for the convenience of the pollen-carriers. The deep-throated flowers, such as the petunia, are fitted for the long tongues of moths and butterflies; the deep nectary of the nasturtium, for the convenience of the humming-bird; the lower lip of the sage flower, for the bee to alight upon. In fact almost all flowers are shaped with reference to securing pollination by some means.

Where the Bees and Butterflies Do Their Work

Since the use of the petals is to attract the flower's helpers, we naturally find the most important parts of the flower set in the midst of the petals. These consist of, first, a "pistil" which is formed of two very necessary parts: the basal part called the "ovary," in which the seeds are developed and perfected, and the tip or "stigma." The latter is a sticky, spongy, usual-

"BEAUTY is its own excuse for being," we might say of such flowers as the gorgeous rhododendron bloom above. The varied forms and gorgeous hues of flowers delight every human eye. But flowers need no such excuse, for they are among the most useful parts of the plants which bear them. For ages flowering plants and insects have been partners. The flowers give the insects pollen and nectar to eat; in return the insects carry pollen from flower to flower. Such cross-pollination enables plants to produce stronger seeds than they could without it. The bees, butterflies, and some moths are the chief insect partners; the humming-bird is also a partner. All of these are attracted by color. So, long before man appeared on earth to enjoy the colors of flowers, these colors existed to promote the welfare of the plants in future generations. We might think of flowers as the plant's advertisements, that say in insect language: "Fly right this way and get some pollen and nectar!"

ly button-shaped bit of open plant tissue, which catches the pollen grains and holds them while they send down their tubes to the "ovules" in the ovary, carrying the necessary material to enable the ovules to grow into fertile seeds. Often there is a stem between the ovary and stigma which holds the latter up in an advantageous position; this is called a "style," and is prominent in lilacs.

The second essential part is the one that produces the pollen; it is called the "stamen," and its most important part is the "anther," which usually forms a double pocket in which the pollen grains grow. When the anther is ripe the pockets open, letting out the pollen dust to be carried by insect or wind to some waiting stigma of the same species. But to do this the anther must be in a position where it can be reached by the pollen carrier; thus it is often provided with a stem called a "filament" which holds it up or out advantageously. The pollen grains are so small that they look like dust, but each grain is of a definite form and in some species is ornamented with knobs or markings.

The arrangement of pistils and stamens in different flowers shows an amazing amount of variation. In

many of the most familiar garden plants, every part of the reproduction system is found in each flower, the pistil rising from the center, surrounded first by anthers, and then by a ring of petals. Some flowers, however, have just one or more pistils but no stamens and they are called "pistillate"; others have stamens and no pistils, and are called "staminate." Sometimes both pistillate and staminate blossoms grow upon the same plant, and such plants are called "monoecious." In other types, each plant produces only one kind of flower, and plants of this sort are called "dioecious."

The Protectors of the Petals

Thus we see that the special treasure of every flower are the parts that produce the seeds, and that these are usually surrounded by the petals to attract pollen carriers. But the petals are delicate in texture and need protection while growing; and to supply this, many flowers have "sepals," which are more tough and firm than the petals and which completely cover the very young bud. Sometimes, as in the tulip and lilies, these sepals take on the color of the petals as the flower opens; and sometimes, as in the larkspurs, the sepals change to blue and give the color call to insects. But we can always tell which parts of the flower are sepals by noting the outside of the young bud. There are some flowers that are protected in the bud by a leaf envelope like the "spathe" of the daffodil or jack-in-the-pulpit, but most flower buds are protected by some arrangement of sepals.

All of the sepals taken together form the "calyx" and if the sepals are united the calyx may be tubular

or cuplike. All of the petals taken together form the "corolla"; and if the petals are grown together, then the corolla may be tubular, as in the morning-glory or petunia. There are some flowers that may lack sepals or petals, and they are called "apetalous"; or the pistils and stamens may be without sepals or petals around them and thus are called "naked."

Clubbing Together to Make a Show

The forms and arrangements of flowers are almost infinite in their variety. Some plants, such as the clovers, geranium, and verbenas, have such small blossoms that singly they could not very well attract insects; but growing in clusters they make quite a show. Such flower clusters are sometimes in the form of close "spikes" or "spikelets"; sometimes as "racemes," with the blossoms distributed loosely upon an elongated axis; sometimes in the form of pyramidal clusters (like the lilac), called "panicles," in which the arrangement of blossoms is regular.

The *Compositae* form a large plant family that has taken a step farther and adopted a coöperative plan for its flowers. The tiny florets are set close together in a solid head, those at the center being perfect flowers, while those set in the rim develop long petals of bright colors to attract the insects. The sunflower is a good example; the outside row of florets produce the petals which form the "rays" of the sunflower, while the inside flowers, which are called disc florets and have an abundance of nectar, develop the seeds. The dandelion, goldenrod, thistle, dahlia, chrysanthemum, marigold, cosmos, bachelor's button, and a host of other common flowers are of this sort.

The Life of a Flower

INSIDE a little seed is a power that no man knows. The great forces of the universe are on its side. Sun and wind and rain, night and day, spring and summer and winter, gravitation and the revolution of the earth, these silent transformers of matter and the conscious hands of human hands, are in partnership with this tiny seed; and as a man with a chisel and a stone produces a thing of beauty, so the mysterious relations between the forces of the universe and a seed produce a joy hind power forever.

No man can fathom the hidden powers that lie behind the flower. In forming the petals and the stamens guides of molecules that build up a flower must take a certain path. Who is it, what is it, that takes a molecule along the one path out of thousands before it might pursue? Who is it, what is it, until first the millions of molecules, with countless then the carpenter, and leads them by the right road. We have seen the seed, then the petal, then the stamens, all the fears and hopes, at last the whole flower is made? but the molecular organization of an army of men, with than that, and its march and perils that go in its train; of a tulip is vaster in number and organization never fails.

We need go no farther than any country lane for the silent witness of these things; we see on every hand the evidence of the mind outside Creation. But what of the mind within Creation? Plain for all to see, as we look at any country scene, is the design of the Hand of God; but invisible in it all, working in the stem and the root and the flower, in the root of an oak, the egg of a bird, and the burrow of a mole, mind is working too.

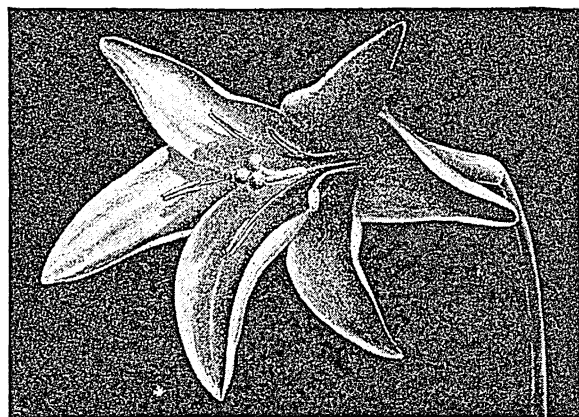
See how the intelligence of a plant will work. A blade of grass will turn towards light too faint for the eye to see, and everybody knows how plants go out in search of the things they like. They arrange their surfaces to the best advantage for drinking in the light; the *Fittonia* plant has a lens-like cell which focuses light so that the plant can receive it from any angle. A root will turn away from certain substances; the root of a cabbage or a pea will grow towards phosphates and turn away from poison. Mosses and ferns will show preference for one substance rather than another; put the sperm cells of moss and fern into water with a little cane sugar and malic acid, and the moss sperms will collect around the sugar and the fern sperms will collect around the acid. The sundew plant will do the same. Let an insect settle on it, and

the tentacles of the sundew grasp the insect and pin it down; if there are two insects the tentacles will distribute themselves and pin both down. Give it a grain of sand, of sugar, or a bit of wood, and the sundew will make no attempt to consume it; but give it something it likes and the plant will eat it.

We think ourselves clever at some things, but have you ever thought how clever a root is? Plant a potato too deep, and what will it do? It will correct your mistake for you; it will throw up a new shoot to the proper level and send you a potato from that. Perhaps you have not wondered why a root bores its way as a spiral into the ground, but it knows the best way to its food supply: a spiral root comes in touch with much more soil than a root going straight down. As the leaves go in search of light, so the root goes in search of water; the root of a poplar tree has been known to travel through 30 feet of soil, under a wall, and through the brickwork of a well.

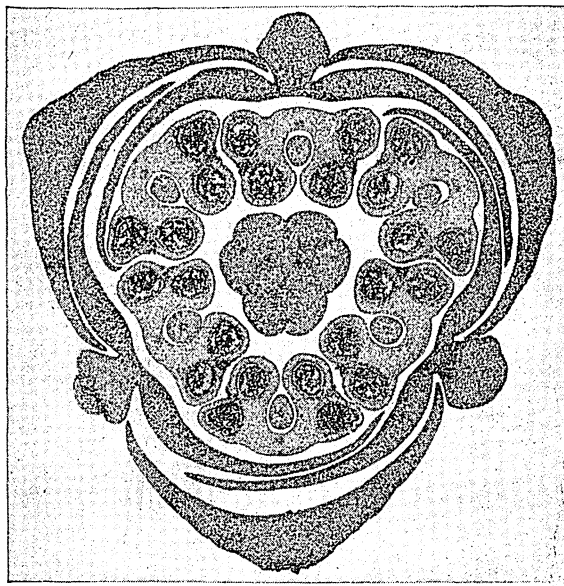
So, as every gardener knows, a plant adjusts itself to the circumstances of its life; if it is rich it lives a life of ease; if it is poor it struggles hard for a livelihood. Let a baby be born in a slum, and the chances are that its life will be very much harder and many years shorter than if it were born in a mansion, and it is simple truth that we can change the life and health and appearance of a plant by changing its environment. It is true, also, of qualities and directions and intensities.

In every garden in America, wherever the humblest flower is grown, a thing is happening that no man in the world can understand. "If I could know you, all in all, little flower," said Lord Tennyson, "I should know what God and man is." It is true. But we do not know the secret of this little thing. The story of a common flower is past the understanding of the mind that can weigh the earth and measure the sun and send the human voice across the sea. Let us go out in the garden and pull a flower and look at it; let us see how a flower works, as we say.

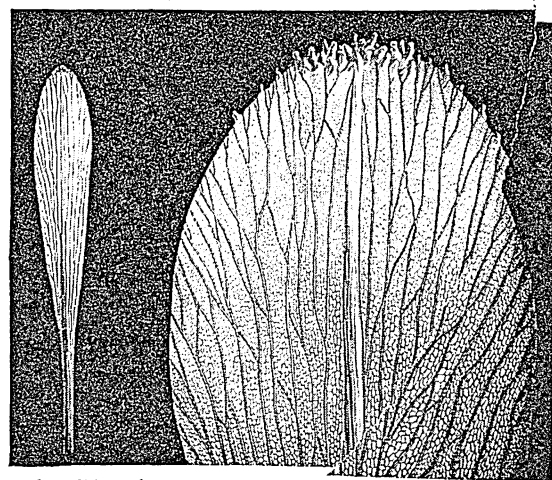


1. This is a Bermuda lily. On the outside are three colored leaves—the sepals; inside these are three other leaves something like them—the petals. Sheltered

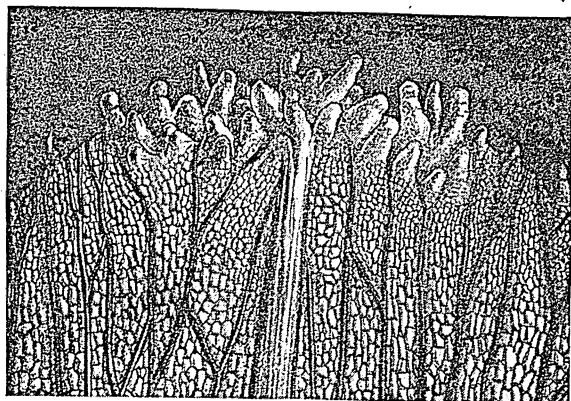
within these protecting leaves are six slender rods—the stamens; they are something like pins with long double heads—the anthers. In the middle of these six rods are three rather sticky little balls—the stigmas. They rise from a sort of stick, the style, which runs down into a hidden case, the ovary, the very home of life. We shall see the wonderful things that happen in this hidden box, the silent factory in which Life works out its wonders. It is inside the swelling, at the end of the stalk.



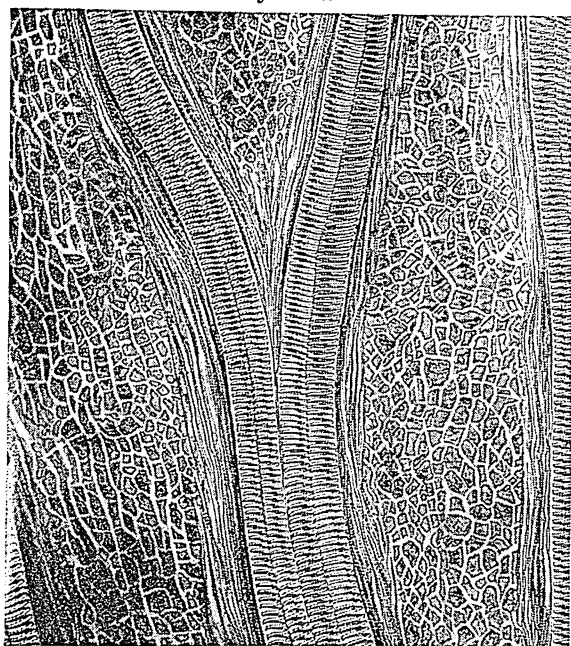
2. The inside of the flower-bud is like this; this is a slice across it. Going into it from the outside we pass three sepals, three petals, and six anthers, and then come to the central style, at the top of which are the stigmas, and at the bottom of which is the ovary, in which the seeds are carried.



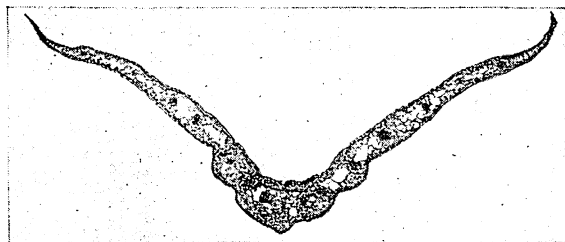
3. Here is one of the petals; on the right is the petal as we see it under the microscope, showing the veins that point the way for the bee when it comes to find the honey deep down in the flower



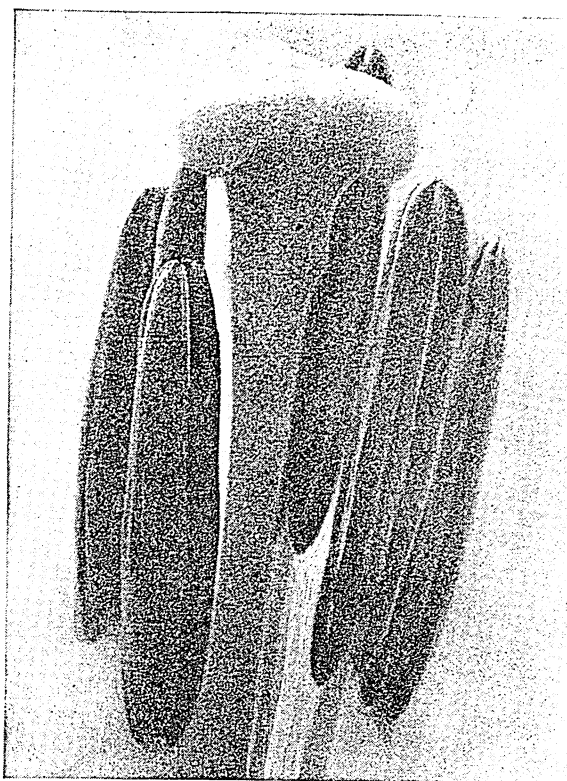
4. Let us look still closer at these petal-tips; their framework is beautifully built.



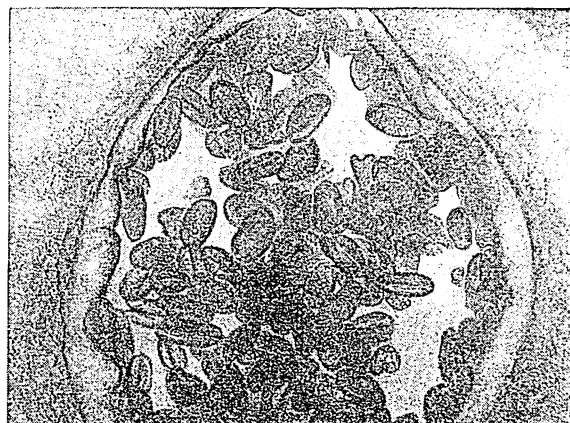
5. Adding to the power of our microscope again, so that we can see still farther into the petal, we find that these veins are wonderful things. Here, in the middle, is a forking vein made of four marvelous tubes built up like a spiral staircase. They carry food to the petals up from the root.



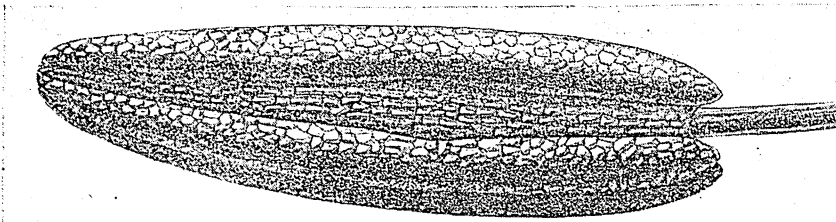
6. If we cut this slender petal in two and put the edge of it under a microscope, this is what we see in this thin edge like paper. The black patches scattered along the strip are the delicate veins.



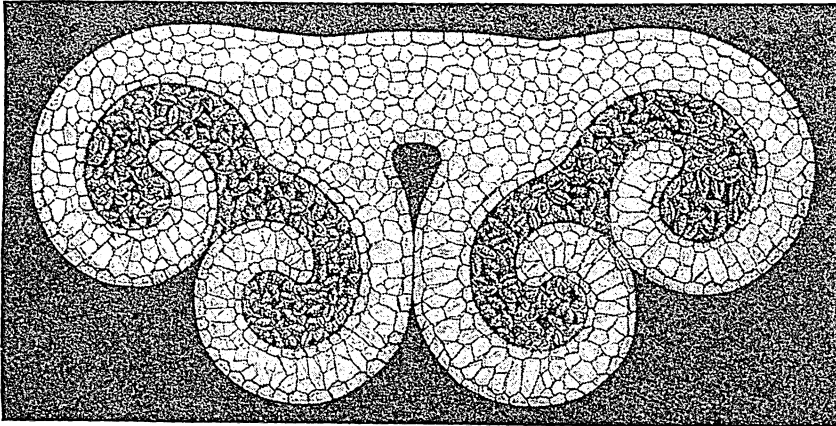
7. Now look closely at the six anthers, six little factories we may call them, clustered round the style that swells above them till the three-fold stigma bursts out at the top. Take your watch out of your pocket and think. Look at the works inside, and then say to yourself, "The works inside these anthers are more wonderful still."



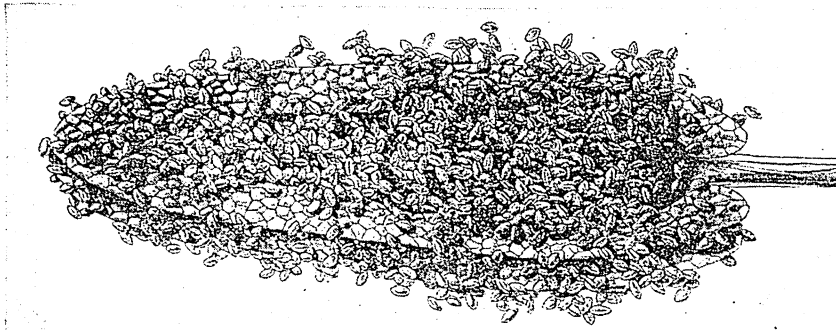
8. Inside these anthers are made the little grains of pollen we see lying in the anther here—the yellow powder that sticks to your finger if you touch it. We may think it is nothing, but is there anything in the world more wonderful? A speck of dust, a great man says, has power enough within it to break a continent in two, and this speck of pollen has the power to feed, to work, and to build up Life itself.



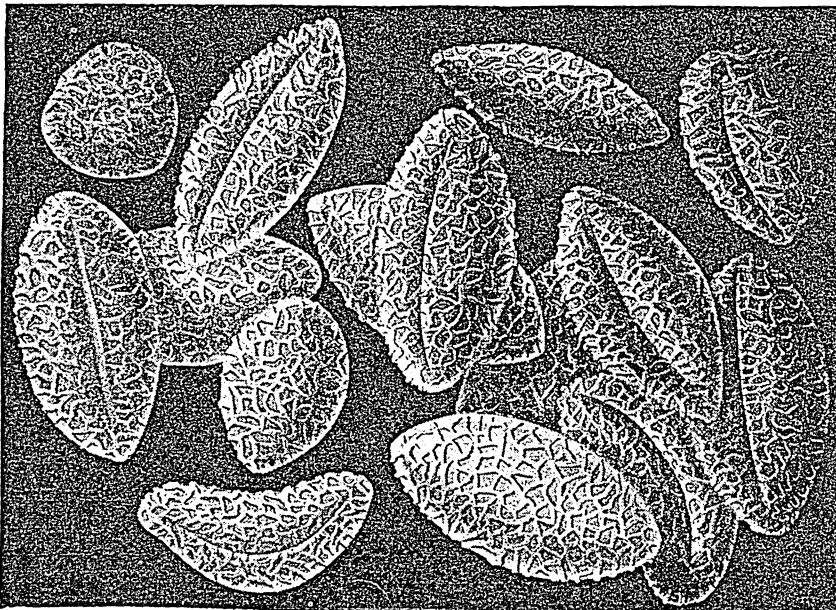
9. Let us look at the anthers under a microscope, while the walls of this workshop stand secure. For they are about to fall, pushed outward by the growing strength within them. Notice what a delicate structure it has.



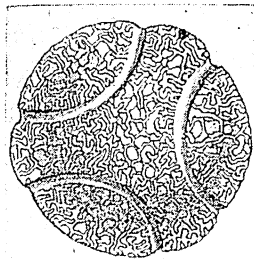
10. Sheltered from all harm are the wonderful grains, seen clearly in this cut across the anther, growing in power and building up the force that is soon to make itself known to us. Owing to the risk pollen grains run of being lost in their business of getting from one flower to another, Mother Nature sees to it that a great many more pollen grains are produced than are really needed.



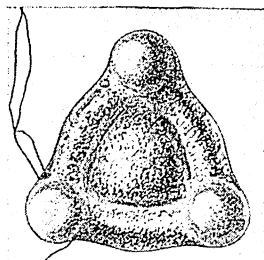
11. Now the grains have burst their bonds, and the anther is yellow with pollen. Like a magician's wand it is, for a touch of this pollen brings a new flower into the world. All that's needed is a breath of wind or the passage of a traveling insect to transport the golden dust, and the miracle is accomplished.



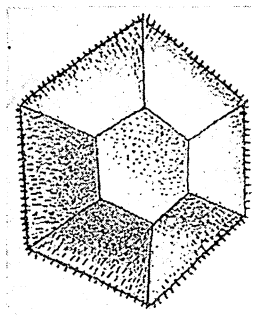
12. We see the pollen grains closely here, greatly magnified. Marvelously are they made, with rough coats by which they will cling to the hairy body of the bee when it comes. Another thing that enables the pollen grains to fly with the wings of friendly insects is that in many cases they have a sticky substance over their whole surface, and this and their variously shaped grooves make them cling together, so that insects carry away large masses of the grains in going from flower to flower. This tends to make the process of fertilization more certain.



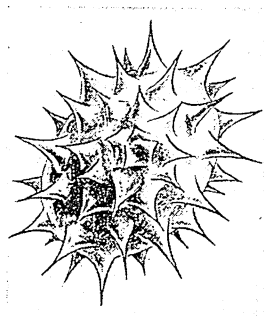
Passion Flower



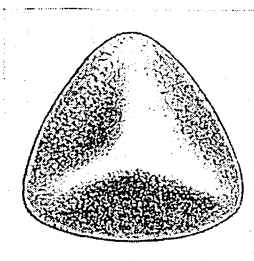
Willow-Herb



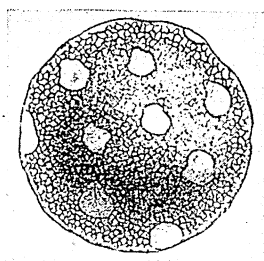
Dandelion



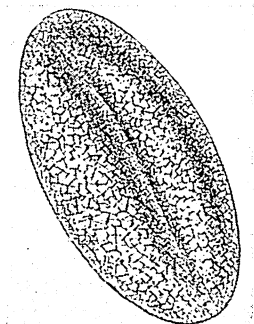
Marguerite



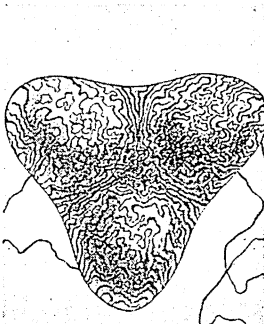
Nasturtium



Phlox

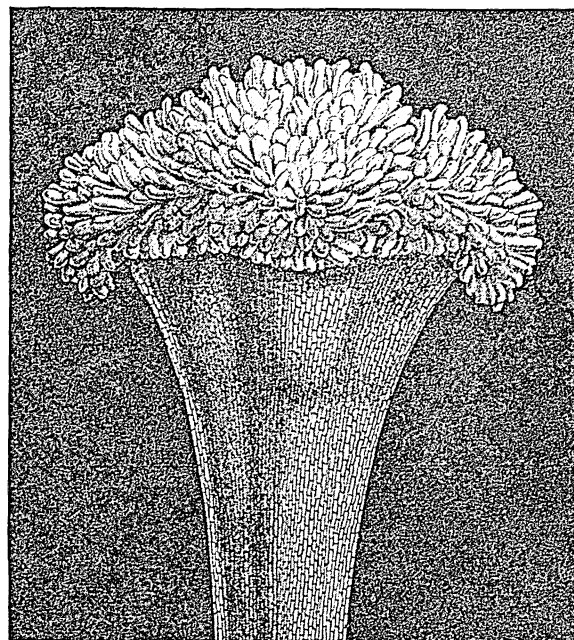


Tiger-Lily

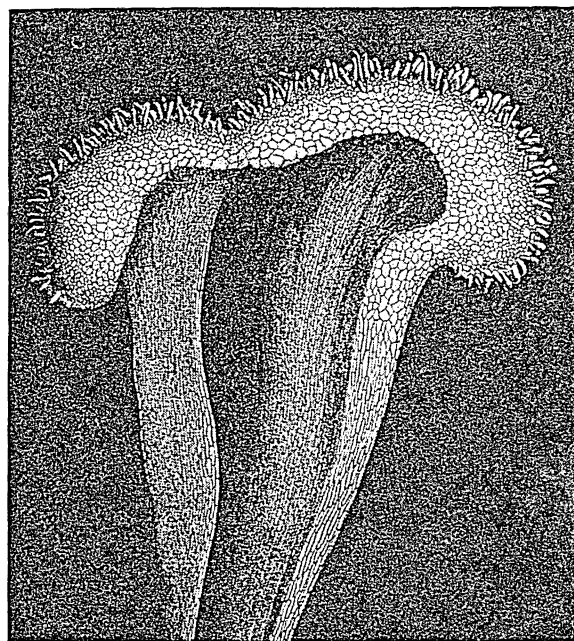


Rhododendron

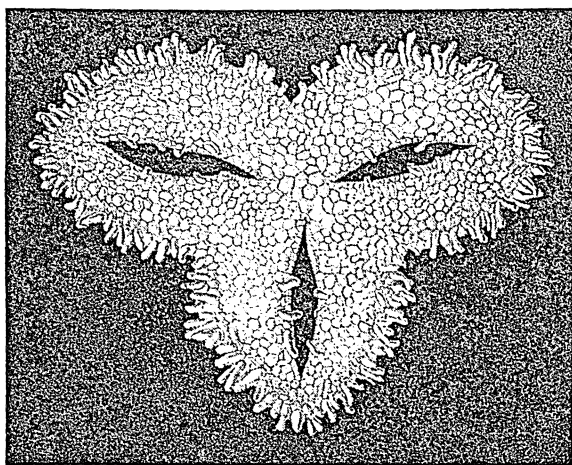
13. How immeasurable and unthinkable are the powers of Nature! No two flower-seeds are quite the same; neither are their pollen-grains. Nature has patterns enough and to spare, and she makes nothing, we must believe, without care and purpose. These few pollen-grains have been photographed under the microscope, and we see how beautifully they are made, though we cannot tell why this should be this and why that should be that. It is part of the great mystery that Life will one day reveal to its children.



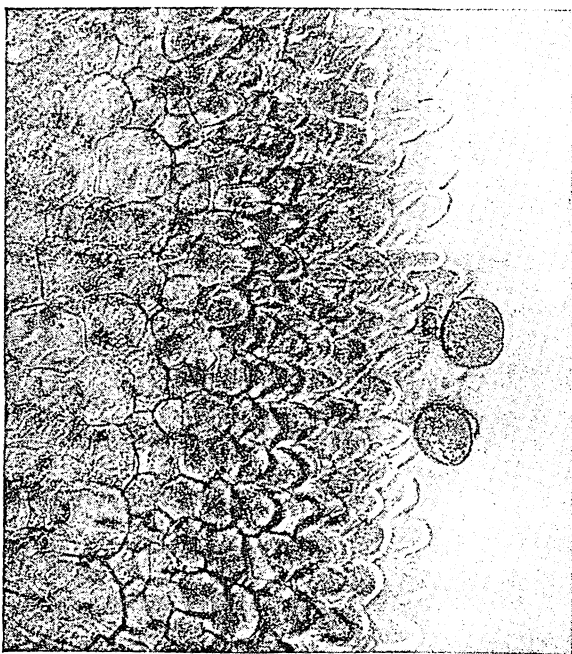
14. Let us look now at the stigma, and look closely at the top of it. We see how easily a grain of pollen may lodge in this rough place held by these rough sticky points which the microscope so clearly shows. Here the grain lies and waits until the moment comes for the great work it is to do.



15. And now we cut right through the stigma downwards until it looks like this. We see its delicate structure, how beautifully it is made, but, more important still, we see a hollow passage down the style. It is an astonishing thing that travels down this passage to the home of life below.



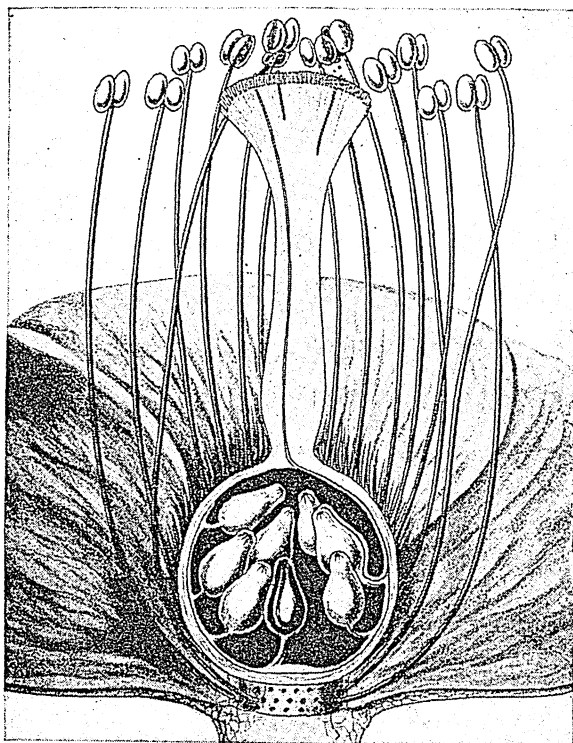
16. There are three of these narrow ways through which there comes to the heart of the flower the messenger of Life. Through each of the three heads of the stigma this hollow passage runs, until the three join in the style and run as one to the ovary below. Here we have cut a slice across the stigma showing the three ways leading to the ovary. These passageways, as we shall see, are the portals which lead to new flower lives. It is through them that the pollen tubes will travel on their errand of creation.



17. Now comes the bee this way, fresh from another flower, laden with its sweet and golden stores, and covered thick with pollen-dust. It must brush past the stigma on its way to the nectar, and it leaves on the stigma tiny grains of pollen from another flower. Here we see them as they lie on the surface of the stigma ready for the great work before them.

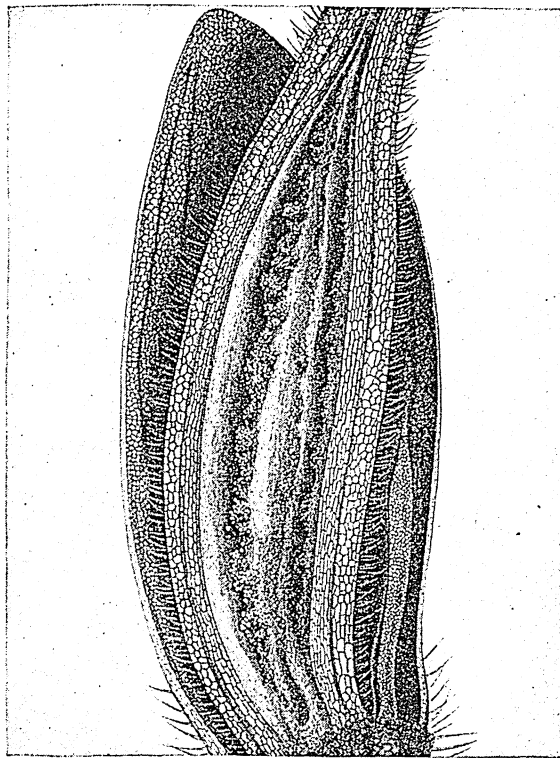


18. And now is the wonder of wonders. The pollen specks make their way down through the stigma till they reach the hollow space. They swell up and each one sends out a wonderful tube. It shoots out and passes down the narrow space until it has reached the ovary, the place where the seed of life is hidden.

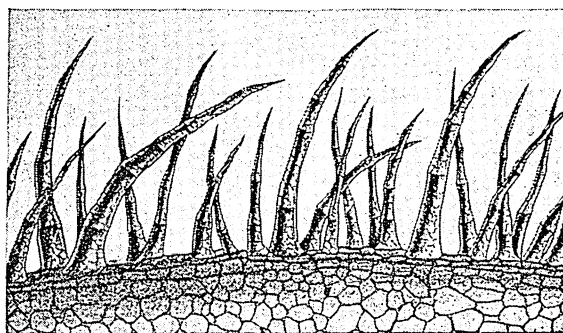


19. This is the place where a flower is born. In this sheltered chamber are colonies of little green things called ovules, clinging with tiny stems to the walls. They lie here waiting for the messenger who comes from the outside world. Soon the pollen-tube arrives, making its way through the wall of the ovary and pushing on until it touches a little green ovule. If the tube does not touch it the ovule must die, but at the touch of the pollen-tube it grows into life, becomes a seed, and will become a flower.

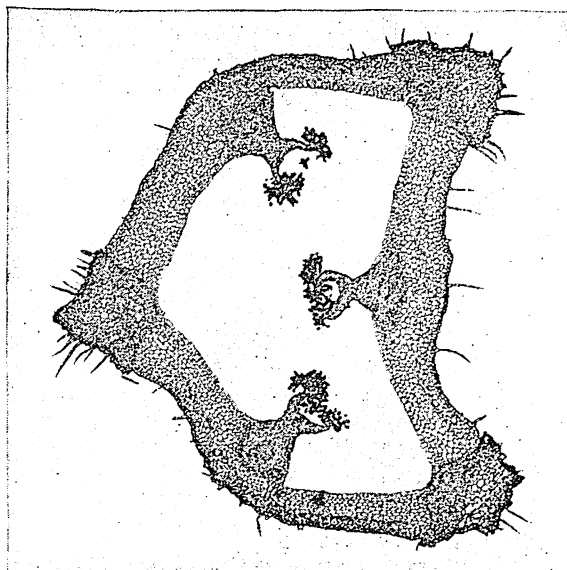
A new life has been born into the world; the wand of Nature's wizard has penetrated her hidden ways and wrought a miracle there, and we have passed by, perhaps unheeding and unthinking.



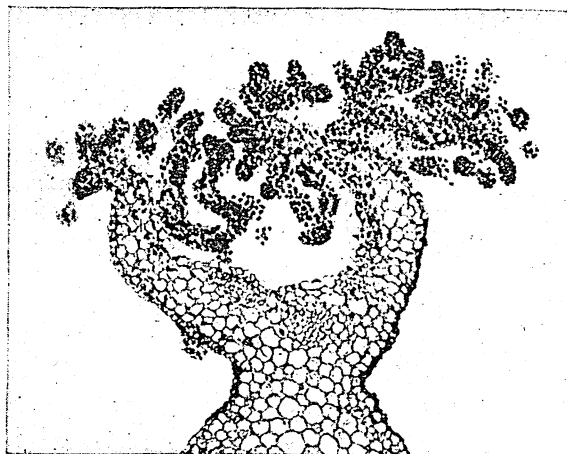
20. Now we will peep into the ovary itself, cutting through it downwards. It happens that we have taken the lady's slipper, a distant cousin of the lily, for this picture. The little white specks on the ridge in the heart of it are the ovules. Marvelously sheltered in this inner chamber where a flower is born, yet the gold dust the bee has brought from far away throws out its tubes and pushes down with its quickening touch until, from this hidden place, there comes out into the world the beginning of another flower.



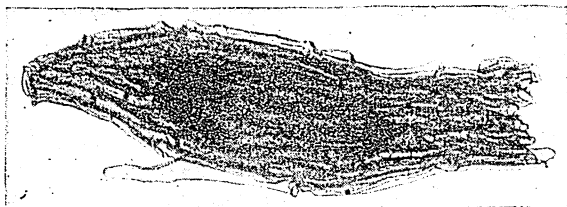
21. Let us notice the little hairs that protect the outside walls of the ovary. Here we see a few of them greatly magnified, and we can realize how powerful they are to serve their great purpose.



22. We have cut through the ovary downwards; now we see it cut across. The little ovules are clustered on the three little ridges.



23. Now we turn the microscope onto one of the three ridges and see the ovules nearer and nearer. Each little group of specks makes up an ovule.



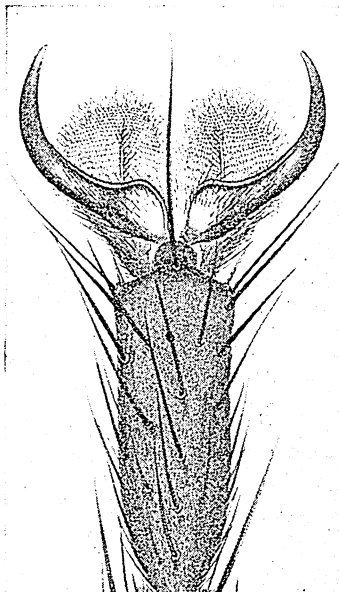
24. It grows into a seed like this. Even here, in this highly magnified photograph of a seed, the eye sees almost nothing; yet this tiny thing, after the coming of a pollen-grain, has in it the power to reproduce the plant in which it grew. It is the cradle in which the beauty of the earth lies asleep.

FLY. One of the deadliest of all creatures is the common buzzing housefly, found wherever mankind dwells. It is no exaggeration to say that during the Spanish-American War flies, as carriers of typhoid and other diseases, caused the death of more American soldiers than did all the bullets of the Spaniards.

Catch a fly and look at it through a magnifying glass. You will see that its claws and padded feet are covered with bristling hairs, that the body is a mass of hairs, that the greedy tongue is spread over with sticky glue. If you could look through a powerful micro-

scope, you would probably find that on those hairs and mixed up with that glue are deadly bacteria—perhaps germs of typhoid fever, tuberculosis, dysentery,

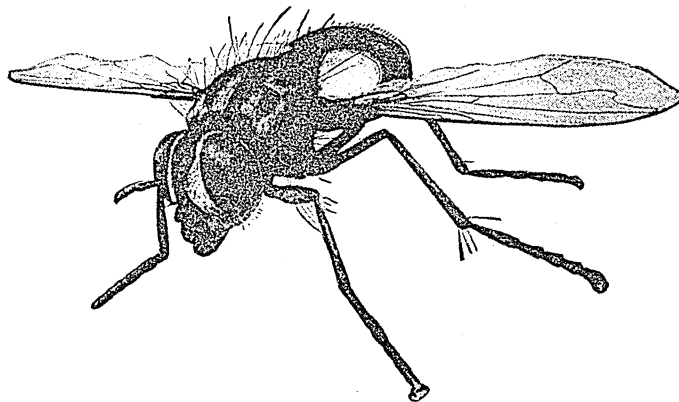
A GERM CARRIER



A fly's foot looks like this under the microscope. Those two horns are claws, and those two pads beneath them enable the fly to cling to a window pane or walk upside down on the ceiling. On these pads disease germs frequently are collected, which are transferred to your food when the fly walks over it.

a drain, or any other place where filth accumulates, usually not more than 200 to 300 yards from the place where she spends her life. So, if you would put down

A DEADLY ENEMY OF MANKIND



This Housefly has been considerably enlarged in the picture. But if we showed him as big as an elephant, it would not be out of proportion to the harm he does in the world.

and a score of other diseases; for this "harmless insect" has probably just visited some infected refuse pile.

"Fly-swatting," except in early spring before the breeding season has begun, is almost useless. The number of flies is not so much regulated by the number of grown specimens that escape the "fly swatter" as by the number of suitable spots the female fly can find in which to lay her eggs. And while she would rather lay them in horse manure than anywhere else, if necessary she will use a garbage can,

flies, don't let them breed. If people would not allow filth to gather there would be no flies.

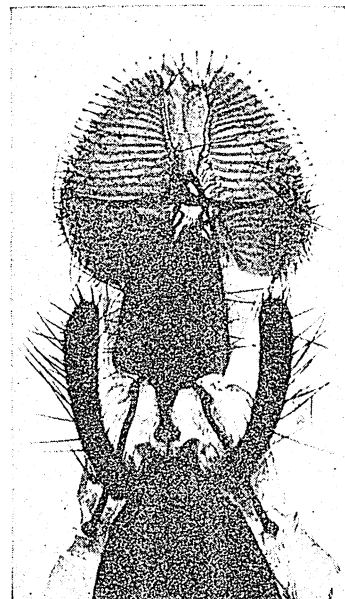
Let us trace the short life of a housefly and then we shall best know how to get rid of them. Each year a certain number of flies and their larvae live over through the winter. As soon as the warm weather appears, the female, who has been hanging behind a picture molding or a bit of torn wall-paper, comes out and looks for a place to lay her eggs where moisture and filth exist together. Inside of one day, the first batch of about 150 eggs has hatched into small white larvae or maggots. After

about five days each maggot goes into the pupa stage, in which the baby fly is wrapped in a tough protecting shell. About five days later a full-grown fly emerges from each chrysalis. Since the maggots, which develop in only a few days, can travel considerable distances, the only way to check fly-breeding is to remove garbage and manure twice a week, if these articles are not screened or treated with chemicals to destroy the eggs.

It has been computed that between April and September one wintered-over female fly might theoretically have 5,598,720,000,000 descendants, if all her female offspring live and start laying eggs in proper time. Of course they don't all live and lay eggs, but enough of them get through to help make the human

death rate from typhoid about five times as great during the summer fly-season as it is during the winter months, when the flies are not active.

THE FLY'S TONGUE



With this tongue of his the fly dabs at our food. It is here shown flattened out for examination under the microscope. It is made up of very tiny tubes opening into two larger tubes which connect with the mouth.

Killing one fly in April, therefore, amounts to killing millions of flies in August. If the successive generations of females should find no places to breed, it is easy to see that flies will simply cease to exist; and when flies cease to exist typhoid fever, dysentery, and certain other diseases which particularly attack young babies will be greatly lessened.

Besides the housefly there are many other members of the fly order, very different from this unwelcome guest of our households. The mosquitoes, for instance, are among the other obnoxious and dangerous members of the group (see Mosquito). So are the flesh flies, which lay their eggs in stored meats; botflies or heel-flies, which torment and kill cattle, sheep, and horses; and gall gnats, which damage crops.

Much damage is done by the fruit flies, which lay their eggs and breed in fruit. Especially harmful is the Mediterranean fruit fly, which appeared in the United States in 1929 and worked havoc with the Florida citrus fruit crops. This is also a serious pest in Hawaii.

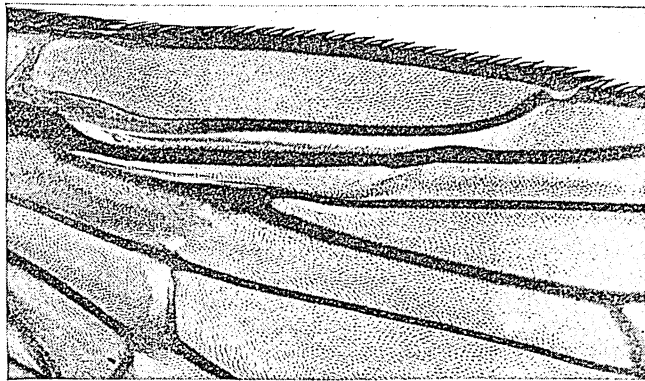
Among the other members of the fly order are the tiny midges and the fungus gnats; the blood-sucking black flies, those terrible pests of the northern woods, fierce biters that have been known to kill men and animals; the horse-flies, which frequently bite persons in wet bathing suits; the bee-flies, which mimic the appearance of bees and feed on the nectar of flowers; the syrphus flies, which resemble bumblebees and wasps, and destroy great numbers of plant lice; the drone flies, whose larvae live in foul water, where they eat up decomposing vegetable matter; the robber flies, which swoop down on other insects with murderous greed; the bee lice, bat ticks, and sheep ticks, which live upon the bee, the bat, and the sheep as parasites, and which have no wings, but belong to the fly family just the same.

Less interesting members of the group are the louse flies, the nimble flies, the flesh flies, the thick-headed flies, the hump-backed flies, the flat-footed flies, the big-eyed flies, the March flies, the false crane-flies, and many others. Of the 40,000 described species of flies, about 11,000 occur in North America. Flies are among the oldest of insects. Their fossil remains are found in rocks of early geologic ages, and also preserved in amber. (See Amber.)

Flies constitute the order of *Diptera*, which comes from the Greek words meaning "two wings"; scientific name of housefly, *Musca domestica*.

FLYCATCHERS. Sticky fly-paper gets the fly indoors; the flycatcher family of birds get it out-of-doors —and besides they take countless other harmful in-

A FLY'S WING UNDER THE MICROSCOPE



Beautiful gauzy thing, isn't it, this fly's wing? And he's a wonderful flyer too, the fly. When he flits about so airily and lightly, those wings move at the rate of 330 beats per second, according to the estimate of scientists. They are moved by powerful muscles and supported and strengthened by those veins or ribs called "nervures."

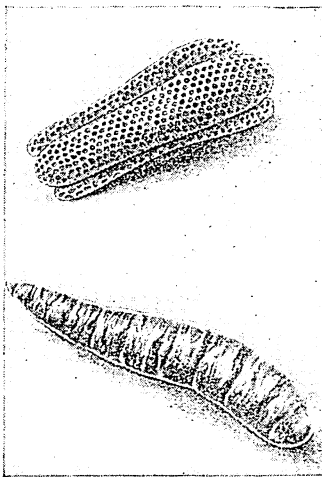
sects, such as grasshoppers, weevils, moths, and caterpillars. To aid these birds in catching their prey, which they often take on the wing, they are furnished with a gristly hairlike growth at the base of the bill, in some species as long as the bill itself.

Flycatchers of the Old World belong to the family *Muscicapidae*. They are small active birds, in the hotter latitudes very numerous and showy, with crests and long

tail feathers. Such are the Japanese species, commonly pictured on screens and fans. These birds live in the woods and are usually songless and solitary.

The American flycatchers belong to the family

EGG AND LARVA



The lower picture shows the larva of a Housefly, which inside of 10 days will become a flying insect. Its mouth is at the pointed end. The upper picture shows the greatly magnified egg of another species of fly, remarkable for the delicate "honeycomb" pattern.

Tyrannidae. There are about 400 species, of which only about 30 are found in the United States. They are mostly small dull-colored birds, but many have a touch of bright color about the head. These birds inhabit the open country, frequenting orchards and gardens. Some species nest in the crannies of buildings. Many kinds show a liking for water, and in dry climates every roadside watertrough has its attendant flycatcher. Most members of the family are songless, but many have very musical calls.

One of the most remarkable of the species is the *scissor-tailed*, of the southwest. It is a tiny black and gray bird with pink trimmings. Its deeply forked tail is sometimes 10 inches long; when excited it has a scissor-like way of opening and closing this appendage.

Besides the birds called by the family name, this group includes also

the kingbirds (for illustration in color, see Birds), and the pewees, of which the wood pewee and the phoebe are well-known representatives. The kingbird is a courageous and aggressive little fighter, often routing crows and hawks by the fury of its attack. It is about eight inches long, with a black glossy crown, slate-colored back and wings, and a black tail tipped with white. It is usually found

perching on dead limbs and fenceposts and other good points of observation, whence it makes sudden dashes after passing insects.

The wood pewee is a shy forest bird, ranging through eastern North America from Florida to Canada. It is about six and one-half inches long, of dark olive green above and yellowish-white below. Its plaintive little note *pee-a-wee*, *pee-a-wee* is most distinctive.

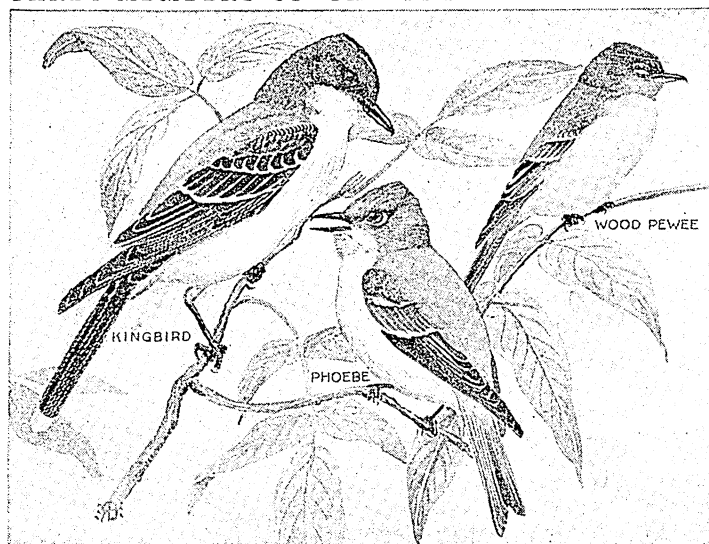
The phoebe, a bit larger than the wood pewee, is of the same general color, but of less shy habit and nests in buildings, seeming to prefer human neighbors. Its call very closely resembles its name.

Scientific name of kingbird, *Tyrannus tyrannus*; wood pewee, *Myiochanes virens*; phoebe, *Sayornis phoebe*.

FLYING-FISH. A "fish out of water" is not always the helpless flopping creature which has given us this common expression for the awkward bungler. Indeed, few things are more beautiful than the sight, so frequent in warm seas, of a company of silvery fish rising

suddenly out of the waves under the steamer's bow and darting through the air like huge dragon-flies.

THREE MEMBERS OF THE FLYCATCHER FAMILY



These bright little birds are all inhabitants of the United States. They look self-confident and plucky, don't they? Just imagine that Kingbird driving off a big Hawk! The Phoebe is a friendly bird, nesting by choice in buildings, but the Pewee is more shy, preferring the forest.

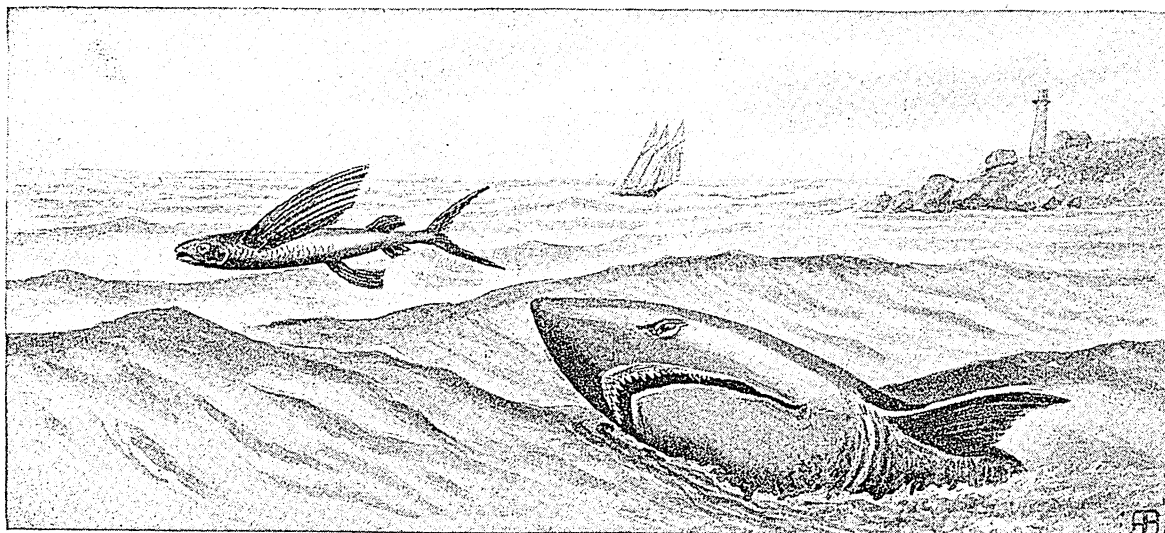
Flying-fish, of which there are about 65 species, are still somewhat of a puzzle. Even scientists are unable to agree as to their method of flight, some asserting that the fish propel themselves by their big front fins; others saying that these fins act only as flying planes and that it is the speed with which the fish shoot out of the water that carries them along. The smaller flying-fish of the Atlantic Ocean cover short distances only out of water, but the

larger species, found off California, often travel 200 yards. Their fins are eight or nine inches long.

All flying-fish use their power of flight to escape from their numerous enemies, chief of which are sharks and the tuna fish. They sometimes fall on the decks of ships in their frantic efforts to outdistance their pursuers. Most varieties are excellent food.

Scientific name of common flying-fish, *Exocoetus volitans*; of California flying-fish, *Cypsilurus californicus*.

THE SHARK AND THE FLYING-FISH



One of the favorite sporting events off the coast of California is a 200-yard dash, like that shown in the picture, between a shark and a flying-fish; but it's anything but sport for the pretty little fish with the winglike fins. Let us hope this picture shows the beginning and not the end of the race. One might assume from that despairing look in the shark's face that he had lost. But it really means nothing; his mouth is built that way.

FOCH (*fôsh*), MARSHAL FERDINAND (1851-1929). "Outflanked on the right, outflanked on the left. Situation on the whole excellent. Am going to advance." This, tradition has it, was General Foch's message to General Joffre at the battle of the Marne in September 1914. And advance he did, a fact that in large part accounted for the glorious French victory and for the saving of Paris from German occupation. Upon this occasion and throughout the more than four years of hard-fought battles that followed, Foch's unchanging confidence, and his ability to inspire his men with the same deep conviction of victory, was one of the chief causes for his rapid promotion and the ultimate triumph of the Allied cause.

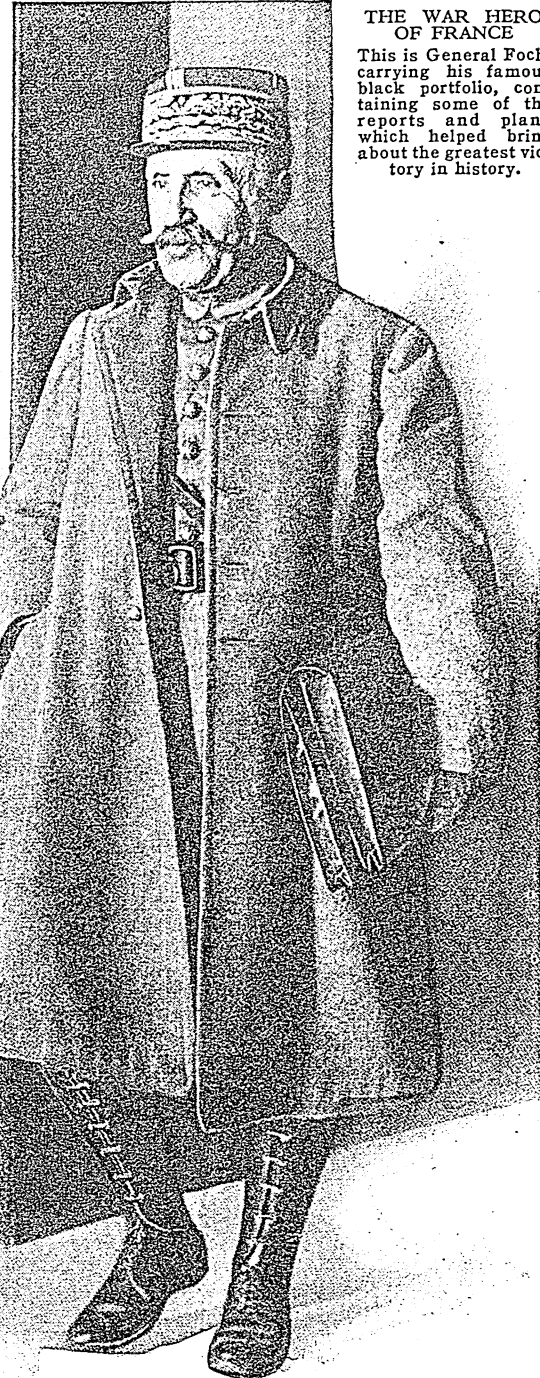
Like his predecessor Joffre, General Foch was a son of the south of France. For years he had been professor of military strategy, and later director of the War College of France, and his books on the art of war had become famous throughout Europe. He believed firmly that the only way to win battles was sooner or later to take the initiative and advance against the enemy. "To make war," said he, "is to attack." But this did not prevent him in practice from being extremely careful not to be led into rash advances.

After the Allies had made a tremendous but unsuccessful attempt to drive the Germans out of France, in May 1917, Foch was made Chief of Staff of the French Army. At this time the hopes of the Allies were low. They were even lower in March 1918, when the Germans began their big advance in the West. Indeed it looked for a time as if they might go right through Amiens to the English Channel. But the spirit of Foch prevailed. He simply refused to admit that he was beaten. "Before Amiens, in Amiens, and behind Amiens, I will go on fighting," he declared. On March 26, Foch was made Commander-in-Chief of the entire Allied army, and presently the advance of the victorious Germans was stopped.

Then, on July 18, Foch began the great Allied offensive, which never ceased until complete victory was won. "We have begun and we shall continue," he declared. First at one place, and then another, the French, British, and American armies under his direction hurled the enemy back until they were driven out of France. Then came the armistice of Nov. 11, 1918. On the follow-

ing day Foch addressed his victorious troops as follows: "You have won the greatest battle in history, and saved the most sacred cause—the liberty of the world. Well may you be proud. With immortal glory you have adorned your banners. Posterity cherishes for you its gratitude."

On Aug. 16, 1918, he was made Marshal of France, the highest honor the French republic could bestow.



**THE WAR HERO
OF FRANCE**

This is General Foch, carrying his famous black portfolio, containing some of the reports and plans which helped bring about the greatest victory in history.

FOG. One of the most frequent experiences which one has in crossing the ocean in winter months is to pass through a fog. The great whistle of the steamer blows at regular intervals, sending out a hoarse warning note that has a tendency to make travelers thoughtful. They know that about them on the sea are other boats, large and small, great liners and fishing boats, which are invisible through the thick veil of fog and may smash into one another. Off the Newfoundland Banks many a small fishing boat has been run down by an ocean liner during the heavy fogs that prevail there. The larger boats themselves have at times collided in the gloom or have struck icebergs, like the ill-fated *Titanic*, which sank in 1912 with a loss of 1,517 lives.

Dew and fog are much alike. Dew is moisture which forms on vegetation, while fog forms in the air on particles of dust. "But," you may say, "there is no dust in ocean air; it is clean." Even clean air, however, has some dust in it, and on these tiny dust particles the moisture condenses whenever the temperature is lowered.

There are several ways in which the temperature of a layer of air is lowered. Warm moist air blowing over a cold surface is cooled and must squeeze out some of its water vapor. The fogs off the coast of Newfoundland are due to the fact that the air from warmer parts of the ocean blows over the icy Labrador

Current, becomes chilled, and so condenses its moisture. Fogs form in the valleys through the lowering of the temperature of a body of air. Wind or rising temperature dispels fogs. It is for this reason that fogs usually disappear as the day advances.

The most remarkable fogs are those that form over great cities such as London. At times the fog is so dense that traffic is suspended and people travel about with lanterns. The reasons for London's fogs are not hard to find. The prevailing winds are moisture laden since they blow in from the Atlantic. In winter they meet cooler currents over the land, and mingle with the great amount of dust and smoke floating about over the great city. Fog forms more easily there than in cleaner air and once formed is less apt to clear off. The fog particles become coated with an oily substance and therefore evaporate less readily than over the ocean. The more manufacturing that is done in a city, the thicker and more frequent its fogs become.

The invention of radio telegraphy has done much to lessen the dangers of collision in a fog at sea. Another safety device is the submarine signal system based on the fact that sound travels much farther through the water than through the air. By this system, vessels equipped with microphones detect from afar the throb of a propeller, or the ringing of special underwater bells.

TALES, SONGS, *and* DANCES THAT "JUST GREW"



Bagpipes sound a rousing tune while these Scottish lads and lassies dance the brisk measures of the Highland Fling, each child whirling bright kilties fashioned from the plaid of his clan. This vigorous dance developed among the heather-covered mountains of northern Scotland centuries ago, when "braw" clansmen gathered to celebrate a victory in battle. Steps and music coming down the centuries to their proud heirs are learned by Scottish youngsters everywhere.

FOLK-LORE. Folk-tales, folk-songs, and folk-dances are the Topsy-turms of the literary and musical world. They have no father and mother, but like Topsy they "jes' growed."

In the days of long ago, when the day's work was done, the older folk would tell the younger generations the weird tales of gods and men, of ghosts and fairies and animals, which they themselves had heard their

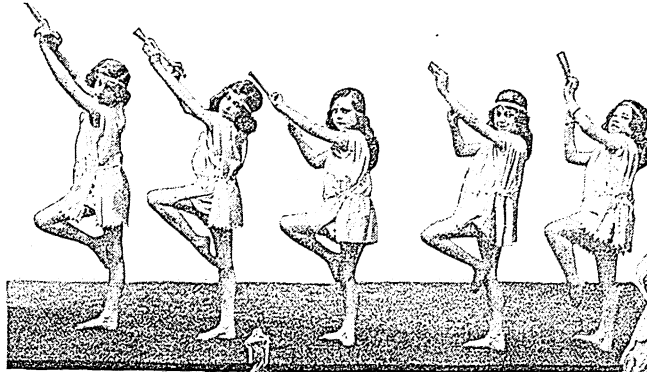
fathers tell. They sang the stirring songs of battle and mournful ballads which had been handed down from a past so remote that no one can guess when it began; and mothers crooned their babies to sleep with lullabies almost as old as the human race. When the harvest had been gathered in, or when the magic fingers of spring were awakening the flowers from their long winter sleep, groups of young men and maidens

TRIPPING GAY FOLK-STEPS AROUND THE WORLD

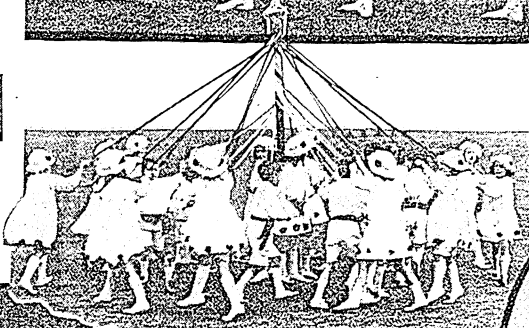
Figures on old Greek vases show the same graceful postures these dainty maids at the left employ as they frolic on the grass in natural movements of dances that originated in dim far-off times.



Wooden shoes clatter as the Dutch lad and lass above hop and circle in a coquettish dance beside the peaceful Zuider Zee.



The bright-eyed Montenegrin pair above leap and twirl in one of the many fiery dances that have been popular in the Slavic countries of the Balkans for untold centuries.



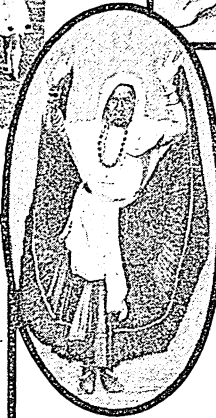
English children wind bright ribbons about a Maypole in their May Day fêtes.



Tambourines jingle, fingers snap, and bright skirts twirl as the gay Italian girls above romp in their swift, vivid dances. Best known of these is the Tarantella, named for the city of Taranto. Folk-lore says that dancing it to exhaustion will cure the bite of the deadly tarantula.



These four Welsh girls link arms as they dance to an ancient tune.



At the left a barefoot maid of India dances before the gods in her temple. The elaborate ritual of such dances is an expression of the ecstasy and mysticism that marks the oriental religions.

Normandy's dances are light and airy, like the flutter of its apple blooms.



Look below at these almond-eyed tots in brilliant kimonos shutting tiny sandaled feet in a festival fan dance. A Japanese myth relates that dancing once brought back the lost light of the sun.



At the right two youngsters in the heavily embroidered peasant costumes of the Ukraine are pictured in a figure of the dashing "Kozak," so popular among the border folk of southern Russia. The folk-dances of Russia are remarkable for their speed and vigor.

danced the strange old dances that others before them had danced for untold centuries. Even today, all over the world, these ancient tales and songs and dances still live. The peasants of England still dance about the Maypole, the Hopi Indians of New Mexico still have their terrifying snake dance, and American fathers and mothers tell their children the story of

a people lived than their songs. Take the beautiful folk-songs of Russia, for example. In their sad minor melodies and strange wild rhythms, even without the words, they give us a picture of a life so grim and sad that its only relief was in boisterous gaiety that still felt the touch of hopelessness. The folk-songs of Switzerland tell us of mountains and valleys; in their

WHEN SWEDISH AIRS RING OUT



These flaxen-haired maidens point the toe in one of the measures that Sweden's peasants love. Some of their dances, rich in pantomime and complicated in figure, are "Hop Mother Amka," "Bleking," "Gustav's Skoal," "Tantoli," and the "Klappdans."

'Little Red Riding-Hood' and sing them to sleep with 'Bye, Baby Bunting.'

Folk-Lore in the Life Story of the Race

Little did the unschooled people of early days think that scholars would one day search out and study their simple lore. But that is being done today by students and societies in many lands. The old superstitions and beliefs in fairies, in ghosts and goblins, in witchcraft and magic; the customs and ceremonies celebrating birth, marriage, and death; the old songs, dances, and games, ballads and tales, riddles and proverbs handed down from the past—all these help us to understand what our ancestors were like, and thus many hidden pages are revealed in the story of man's progress.

The first to make a serious study of folk-lore were the brothers Wilhelm and Jakob Grimm, two gentle German scholars who lived about 100 years ago. Their names are as familiar now to children as to men of learning, for among the tales which they collected from the peasants of Germany are the stories of 'Lucky Hans', 'Hänsel and Gretel', 'Princess Snow-White', and many other favorites with children of today. In a similar way we received from France the stories of 'Puss in Boots', 'Little Red Riding-Hood', and 'Cinderella'; from England the 'Mother Goose Rhymes'; from the American negro the stories of 'Brer Rabbit and Brer Fox', and from many other lands and peoples tales which now belong to the children of all the world. (See Story-Telling.)

So too men have searched out and written down the old songs of all nations—the songs of seed-time and harvests, of winter and summer, crooning nursery songs, love songs, marriage songs, funeral songs, war songs. Nothing tells us more surely the sort of life

melodies we hear the shepherds' pipes and the "yodel" of the Alpine dwellers. The songs of Scandinavia suggest something of the surging of the ocean in their steady rhythm, and through them creeps the plaintive murmur of the waves. The folk-songs of the British Isles reflect the different characteristics of the different people living there together. Thus the Scotch 'Laird o' Cockpen' is as surely Scotch as the 'Minstrel Boy' is Irish, and one would no more mistake one for the other than he would mistake the tones of the bagpipe for the notes of the Irish harp.

'On the Bridge of Avignon'

Have you heard the old French song, 'On the Bridge of Avignon'? This was sung by the girls and boys of France more than 400 years ago. It tells how the people of all classes passed over the same bridge in the same way—lords and ladies, clerks and soldiers, pipers and street gamins. So it gives us a picture of France in those early days. We get a picture of an old time English politician, turning with every change of rule, in the English folk-song, 'The Vicar of Bray'; while the song 'Jenny Jones' gives us a good description of customs and costumes in early England—with its washing and folding and starching and ironing, and its sickness and death portrayed in the stanza:

Jenny is dead, dead, dead,
Jenny is dead, you can't see her now.

Folk-songs are the natural unstudied expression of the common people; they are the laughter and the tears of those who, hundreds of years ago, lived and loved as we do now. The songs of the common people were not made by rule. They sang as the lark or nightingale sings, and their art was so spontaneous that it still gives us pleasure much as when we hear a wild bird sing.

Folk-dances are the twins of folk-songs. Where you find one you find both, and often they even claim the same tune. Many folk-dances tell stories quite as the songs do. Did you ever play the Swedish weaving dance? Does it not tell you the story of the primitive flax harvest and the making of the linen? The rows of dancers advance and retreat, advance and retreat, in imitation of the beating used to separate the flax fiber from the straw. They whirl and skip and clap and we get a glimpse of the old-time spinning; and then the couples go back and forth in the shuttle movement of the weaving, and dance through the difficult over-and-under of the bobbin movement. Then comes the rolling of the finished cloth into the bolt, and the happy workers skip to their homes.

In the shoemakers' dance you all know the—

Over, over, over,
Back, back, back,
Sist! sist!
Rap, rap, rap.

Equally familiar is the sailors' hornpipe, with its hauling the anchor, hoisting sail, paying the slack, and wild heel-and-toe at the sight of land, which is the favorite of all gymnasium classes.

Picturesque National Dances

Nearly every nation has its own distinctive dances, such as the picturesque Scottish reel, the jolly Irish

folk-tales and songs that have grown up in the logging camps of Maine and Oregon, on the cattle trails of Texas and Montana, at Indian camp fires, and in the mountains and on the plantations of the South.

American Indian and Negro Lore

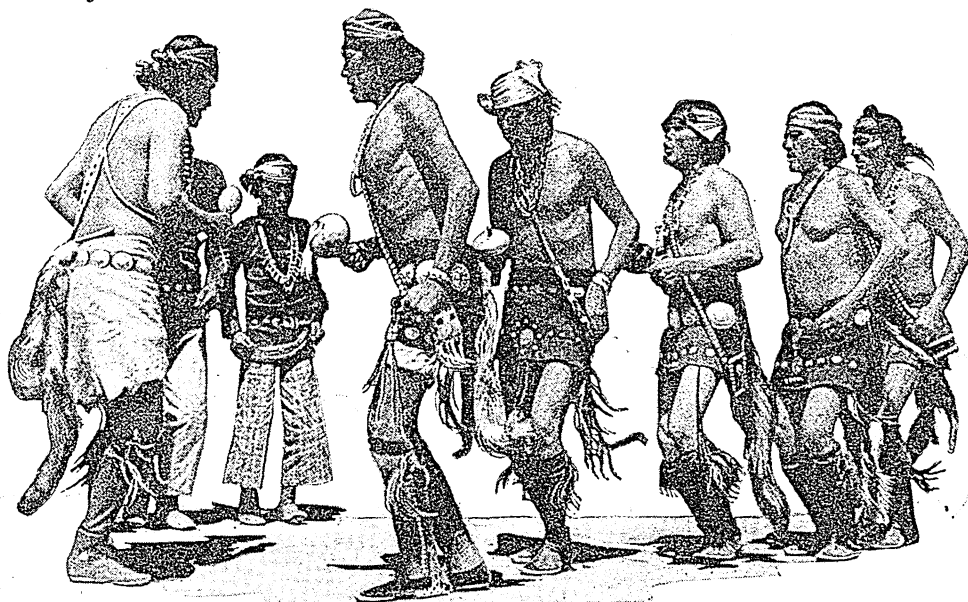
Earliest of American folk-lore is, of course, that of the Indians. The Delaware, after their hunts or at winter camp fires, told of their heroes, giants, and sprites in stories called "tomoacan," which means "tales for leisure hours." Animal stories were popular with the Cree. Indian songs were mostly war songs, but the Kiowa sang love chants of real lyric beauty.

Dignity and rich melody are found in the southern American negro songs, the famed spirituals. Filled with reverent biblical imagery and often inspired by the hardships suffered in the days of slavery, these songs are unique in their appeal. Among the best-known spirituals are 'Deep River', 'Steal Away', and 'Swing Low, Sweet Chariot'.

Negro folk-tales, such as those Joel Chandler Harris collected for his 'Uncle Remus Stories', show a rollicking humor. The negro heartily enjoyed the chipper impudence of Brer Rabbit and the sly schemes of Brer Fox, and their escapades never failed to provoke sympathetic laughter from old and young alike.

Rhythmic work songs of rousing, simple melody help to lighten the toil of negro "labor gangs." Along

NAVAJOS SHUFFLING THEIR SACRED YA-BE-CHI DANCE



Dancing is a religious ceremony among the Indians, and is practised with strict adherence to traditions. These Navajo braves believe this ceremonial will benefit the sick.

jig, the furious Italian tarantella, the stately Spanish saraband, and the lively Polish mazurka. America has no folk-dances of its own, but because Americans are related to the people of so many countries, they are charmed with the dances, folk-tales, and songs that come from their ancestors' homes, and have made them their own. America has, however, a rich store of

southern levees and railroad lines, crews of drudging laborers swing their picks and shovels in time to chants or "hollers" sung by the foremen.

Far to the north, in the hustling lumber camps of Michigan, Wisconsin, Maine, and Minnesota, arose another kind of story and song. Throughout the 19th century, tall, heavy-shouldered lumberjacks—Irish,

Scottish, French-Canadian—crowded close to the bunk-house stove on cold winter nights and bragged mightily about the heroic feats of that king of loggers, Paul Bunyan (*see* Bunyan, Paul). And popular, indeed, was the man who could while away the hours with robust or tearful "shanty songs." Shanty was the name given to any building in a logging camp, and the songs usually glorified the dangers of logging.

In the West the cowboys developed stories and songs of their own. At night around their camp fires they would "yarn" about their hard-riding, quick-shooting adventures. Many of the stories became ballads; set to simple, spontaneous music. Those best known today are the "dogie" songs, which the cowboys made up and sang as they rode herd at night, and as they drove the longhorns up the trail to the Montana grasslands. When the cattle were restless at night, or threatened to stampede on the trail, the cow-

punchers soothed the herd by softly singing some drawling dirge such as 'The Dying Cowboy':

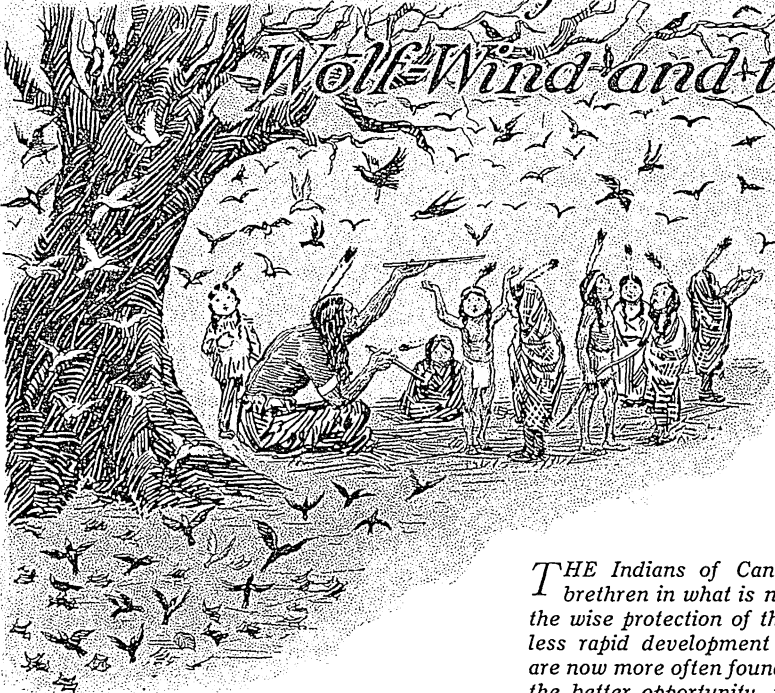
O bury me not on the lone prairie,
Where the wild coyotes will howl o'er me,
Where the rattlesnake lives and the wind blows free,
O bury me not on the lone prairie.

Many ballads the American colonists brought from England, Ireland, and Scotland, are still sung today in the mountain cabins of the Appalachian states. The favorite, perhaps, is 'Bonny Barbara Allan', which tells of the beautiful but cruel girl who spurned young William and left him to die of a broken heart:

They buried him in the old church-yard,
And her next to the choir;
From Willie's breast sprang a red, red rose,
And from hers a brier.
They grew and grew to the old church-top
Till they couldn't grow any higher;
They wrapped and tied in a true lovers' knot
And the rose wrapped round the brier.

A FOLKLORE TALE of the CANADIAN INDIANS

Wolf Wind and the Children



THE Indians of Canada differed little from their red brethren in what is now the United States. But, through the wise protection of the Hudson's Bay Company and the less rapid development of the country, Canadian Indians are now more often found near their original homes; whence the better opportunity, now eagerly being seized upon, to study intelligently the picturesque myths and customs of

these aboriginal Americans. The Glooskap of this story is the Canadian counterpart of the Gitchi-Manitou long familiar to American children in Longfellow's poem, 'Hiawatha'. Legend tells how he came across the great waters from the east, turning his stone canoe into an island until the time came for his return; how he created the beasts and the birds and all living things, including Man; how the Loon was his messenger and the Whale his ocean steed; and how Beaver and Bull-frog set themselves against his will and were punished therefor. The story of the creation of the Little Birds, which is here told, is only one of the interesting stories about Glooskap.

ONCE upon a time, long before the white men came to Canada, there lived a wicked giant who caused great trouble and sorrow wherever he went. Men called him Wolf-Wind. Where he was born no man knows, but his

home was in the Cave of the Winds, far in the North Country in the Night-Night Land. There men knew he was hiding on calm days when the sun was hot and the sea was still, and on quiet nights when not a leaf or a flower or a blade of grass was stirring. But when-

ever he appeared, the great trees cracked in fear, and the little trees trembled, and the flowers bent their heads close to the earth trying to hide from his presence. Often he came upon them without warning and with little sign of his coming. Then the corn fell flat never to rise again, and tall trees crashed in the forest, and the flowers dropped dead because of their terror. And often the great waters grew white, and moaned or screamed loudly or dashed themselves against the rocks, trying to escape from Wolf-Wind. In the darkness of the night, when Wolf-Wind howled, there was great fear upon all the earth.

Wolf-Wind Attacks the Fishermen

It happened once in those old times that Wolf-Wind was in a great rage, and went forth to kill and devour all who dared to come in his path. Many Indian families then lived near the sea, and the men and women fished off the coast. They caught fish to make food for the Winter. They had gone far to sea in small canoes, for the waters had long been still and they thought there was no danger. The little children were left alone on shore. Suddenly, as the sun went down, without a sign of his coming, out of the North came Wolf-Wind, in his great rage, looking for prey and roaring loudly as he came sweeping along.

"I am Wolf-Wind, the giant," he howled. "Cross not my path, for I will kill all the people I meet, and eat them up."

His anger only grew as he dashed along. As he came down upon the fishermen and fisherwomen, far out to sea, he splashed and tossed the waters aside in his fury. The fishers had no time to get out of his way or to paddle ashore. So quick was Wolf-Wind's coming that he caught them in his path and broke up their boats and killed them all. During all that night the giant raged about, looking for more victims.

In the morning Wolf-Wind's anger was not yet spent. Far ahead of him he saw the little children of the fishers, playing on the shore. He knew they were alone, for he had killed their fathers and mothers. He resolved to catch them and kill them too. Roaring as he went, he dashed the waters against the rocks in his madness. As he came near to the beach he howled:

"I will catch you and kill you all, and eat you and bleach your bones upon the sand."

But the children heard him and ran away as fast as they could. They hid in a cave among the great rocks, and placed a big stone at the mouth of the cave so that Wolf-Wind could not get in. The giant howled loudly at the door, all day and all night long; but the stone was strong and he could not break it down. Then he went on his way, still very angry and still roaring; and he cried:

"I will come back and catch you yet. You cannot escape from me."

The children were very much frightened and they stayed in the cave long after Wolf-Wind had gone. Far away they could hear him howling and crashing through the forest. They knew that Wolf-Wind had killed their fathers and mothers on the sea. When at last they came out they ran into the forest seeking a place where they could hide and be safe.

In Willow-Willow Land

So they went to the Willow-Willow Land, a pleasant country with grass and flowers and many streams. Between them and the North Country, where Wolf-Wind lived, were many great trees, with thick leaves, which they thought would protect them.

But one day Wolf-Wind, true to his promise, came again in a rage to find them. He came into the land killing all he met in his path. But he could not catch the children, for the trees, with their thick leaves, kept him away. The children heard him howling in the forest, far distant. For many days in the late Summer he tried to find them. But their home was close to the trees and the great branches spread over them, and the thick leaves saved them; and only the Sun from

*"Should you ask me, whence these stories?
Whence these legends and traditions,
With the odors of the forest,*

*With the dew and damp of meadows,
With the curling smoke of wigwams,
With the rushing of great rivers,*

*I should answer, I should tell you,
'From the forests and the prairies,
'From the great lakes of the Northland'."*

—LONGFELLOW.

the South, coming from the Summer-Flower Country, could look in upon them. Try as he did with all his might, old Wolf-Wind could not harm the children, though he knew that they were there. So they were always safe while they lived in the Willow-Willow Land.

Wolf-Wind became more angry than ever because of his failure, and his rage knew no bounds. He swore that he would have vengeance on the trees. So he came back again, bringing to his aid another giant from the North Country, who had with him a strange and powerful charm, the Charm of the Frost. The two giants tried to kill the trees that had saved the little children. Over some of the trees they had no power, for when they came the trees only laughed, as they swayed and creaked, and said:

"You cannot harm us. We are strong, for we ourselves came at first from the Night-Night Land, in the far North Country; and over us the Charm of the Frost has no power." These were the evergreens—the Spruce and the Fir, the Hemlock and the Pine and the Cedar.

Takes Vengeance on the Trees

But on the rest of the trees Wolf-Wind took the vengeance he had vowed. When the harvest moon was shining in the sky he came without warning and, with the help of the Frost Giant, he killed all the leaves that had kept him from the children and threw them to the ground. One after one the leaves dropped from the Beech and the Birch, the Oak and

the Maple, the Alder and the Willow. Some fell quickly, some fluttered slowly down, and some took a long time in dying. But at last all the broad-leaf trees stood bare and cold against the sky, and there was stillness and sadness in the forest. Then Wolf-Wind laughed and played through the leafless branches with the giant from Night-Night Land. And he said:

"Now I have overcome the leaves that kept me away; and when I please I can kill the children."

But the children only moved closer to the strong and sturdy evergreen trees that had come at first from the far North Country, and over which the Charm of the Frost had no power. And Wolf-Wind could not reach them, and they remained forever safe from the giants.

The children were very sad when they saw what Wolf-Wind had done to their friends of the hardwood forest. Summer had gone back to the Southland, following as she always did the Rainbow Road to her home in the Wilderness of Flowers. It was lonely in the forest, and silent. There was not a whisper in the trees. There were no leaves, for it was Winter and Wolf-Wind had killed them all.

How Glooskap Brought Back the Leaves

At last the time of year approached when Glooskap, the Indian god who ruled the earth in those days, gave his yearly gifts to little children. He came on a sled drawn by his faithful dogs, to find out for himself what the children wished. And the children would all come to him, each asking for a boon.

Now Glooskap had great power upon the earth in that old time. The little children whom Wolf-Wind had tried to harm in his rage came to the Magic Master of Gifts, and they were all very sad because the leaves were gone from their forest friends.

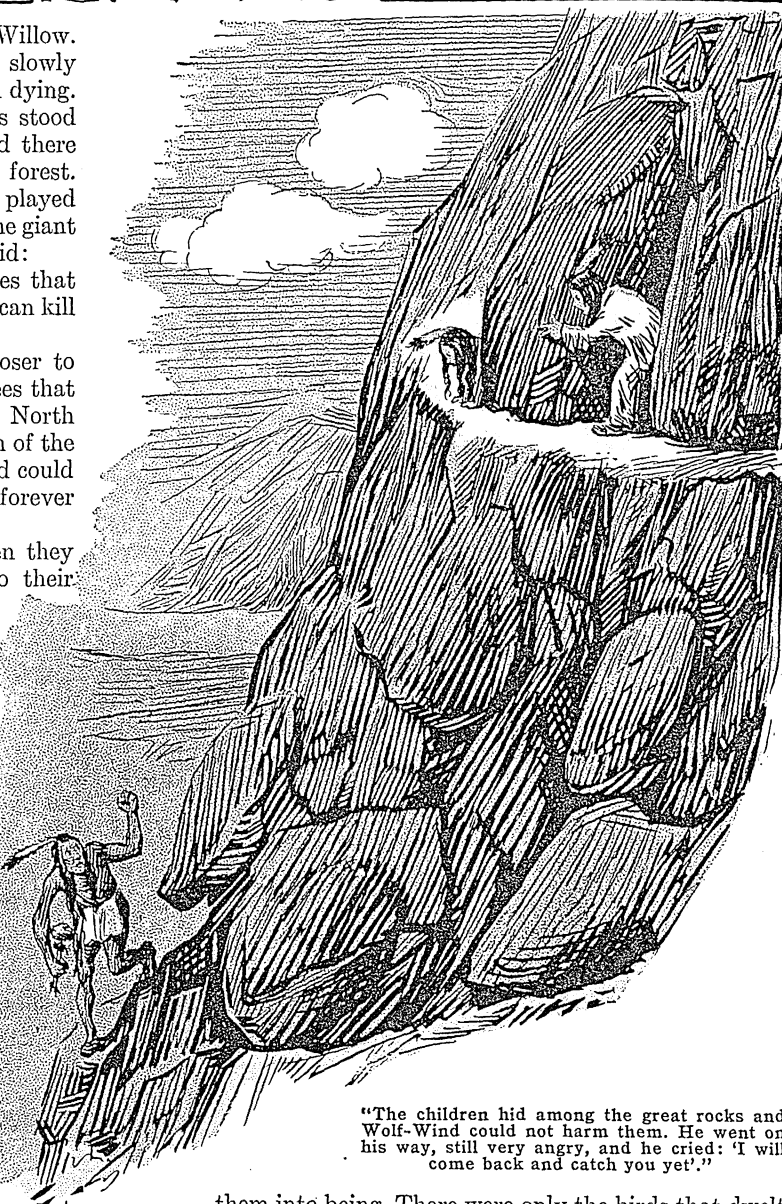
"What do you wish?" said Glooskap.

"We wish nothing for ourselves," said the children. "But we ask that the leaves that were killed by Wolf-Wind be brought back to life and put again in their old places on the trees."

Glooskap Puts on His Thinking Cap

Glooskap was silent for a long time. He sat in thought, as was his custom; and he smoked hard at his mighty pipe, for he was a great smoker.

Now, at that time there were no little forest birds upon the earth, for Glooskap had not yet brought



"The children hid among the great rocks and Wolf-Wind could not harm them. He went on his way, still very angry, and he cried: 'I will come back and catch you yet!'"

them into being. There were only the birds that dwelt near the sea, and over whom Wolf-Wind had no power—Seagull and Crane, Wild-duck and Loon, Kingfisher and Brant and Curlew. These only laughed when the giant raged, and screamed in mockery as they flew from him or hid among the rocks and the thick grass of the marshes. There were also the sturdy birds that dwelt with men and worked for them, giving them eggs and food—these were Hen and Goose and Duck and Wild Turkey. They gave men food, but they were not fair to look upon. They waddled along and could not fly well; and they made no sweet music upon the earth, for their song was but a quack and a cackle.

Why the Leaves were Changed to Birds

After Glooskap had smoked long in silence he hit upon a plan. He said to the children:

"I cannot bring back to the trees the leaves that Wolf-Wind has killed and stripped off, for it is now too late. But I will take the fallen leaves and change them into little birds. These will bring happiness to you on the days when Summer dwells in the land; with their pretty feathers and their pleasant songs. And the birds shall never forget how they were born. When Autumn comes they shall go with Summer far away to the Summer-Flower Land. But in the Spring they shall always come back, and they shall live as close as they can to the leaves from which they have sprung. They shall nest, most of them, in the trees under the leaves; and even those that nest in the grass love the trees and linger in them. And they shall all be beautiful in color like the leaves that gave them birth. They shall have power to rest at times upon the air like a leaf fluttering; and the voice of the air and the laughing waters shall be in their throats, and they shall sing sweet songs for little children.

"I give the children charge over them, to keep them from harm just as the leaves which gave them birth have saved the little children from the giants. And I will give the trees, that Wolf-Wind has stripped, power to bring forth new leaves every Springtime, so that when Summer comes back from the Wilderness of Flowers the trees shall not be bare. Though Wolf-Wind may strip off the leaves when the Frost Giant comes with him from the Night-Night Land, they shall always be replaced in the Spring. And I will take away much of Wolf-Wind's power, so that he can no longer harm little children as wickedly as he has done."

Long Yearly Journeys of the Birds

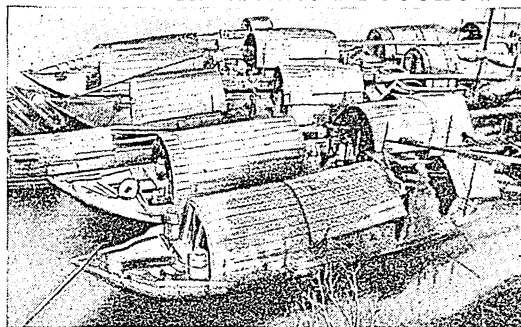
Then Glooskap waved his magic wand, as was his custom. At once great flocks of little birds sprang from the ground where the fallen leaves had lain. They twittered and sang in a great chorus and flew back to the trees. They were of beautiful colors, like the leaves that had given them birth. Among them were Robin Red-breasts and Thrushes, all brown and red from the red and brown leaves of the Oak. And there were Finches and Hummingbirds, all yellow and green and brown from the leaves of the Alder and the Willow; and they glowed like Willows in the sunlight and fluttered like leaves upon the air. There were Yellowbirds and Canadian Warblers from the golden Beech and Birch leaves. And there were Scarlet Tanagers and Orioles and Grosbeaks, all of changing colors, red and purple and brown, from the leaves of the Canadian Maple. And they all sang to the children, and the children were very happy again.

Then Glooskap sent the little birds all away to a warm country, until the rule of the Frost Giant from

the Night-Night Land was over; for it was Winter in the land and it was very cold. But in the Springtime the little birds always come back from the Summer-Flower Land. They build their nests among the trees, as close as they can to the leaves from which they came. And all day long they sing among the leaves for little children. But at night they hide among the leaves from Wolf-Wind, and never utter a twitter or a song. They do not forget that they are the children's gift from Glooskap, and that they come from the leaves Wolf-Wind stripped from the trees in his rage when the children were saved long ago.—From *'Fairy Tales from Canada'*, by Cyrus Macmillan.

FOOCHOW, CHINA. Thirty-four miles up the river Min from the China Sea, the traveler comes upon the ancient city of Foochow, or Minhow. In spite of some modern installations such as an electric-light plant, Foochow remains less Europeanized than most of the

ON THE MIN RIVER AT FOOCHOW



As is common with all Chinese cities having waterways, Foochow's harbor is always crowded with covered wooden boats like these, used for cargo and living quarters.

great port cities. This may result from the lack of direct import and export trade with foreign lands other than Formosa. Foochow is an old walled city, with wooded hills, tall pagodas, and a bustling trade with other coast cities in local manufactures and agricultural products. The river teems with traffic. Jostling for space are dilapidated houseboats and ornate junks, frail river craft, and smart new steam launches. Down-

stream from the interior come small boats laden with fruit, cotton, and rice. Outgoing boats are stacked with tea, timber, paper, canned foods, bamboo, matches, spices, grain, and silk and cotton goods from the Foochow mills. Other exports are fine lacquers, dainty steatite or soapstone figures, carved ornaments, and artificial flowers.

The streets are narrow and dirty. Passage is difficult in some because of the crowded display of goods. The principal thoroughfare runs through the south gate, continuing to the river, where it meets the famous "Bridge of Ten Thousand Ages." This ancient structure, more than eight centuries old, connects the river-bank with the busy little island of Tongchui. The bridge is 1,350 feet long, built of enormous slabs of gray granite.

Foochow lies about midway between Amoy and Shanghai, opposite the northern end of the island of Formosa. It is the capital of Fukien province, which by geographic conditions is cut off from the rest of China. The city reached its greatest prosperity in the early 19th century, when the tea trade was at its height. It was one of the five original treaty ports created by the Treaty of Nanking in 1842 (*see* China). It is the seat of Fukien Christian University. Population, about 350,000.

FEEDING *the* WORLD—a TRIUMPH of COÖPERATION

FOOD. Of man's three elemental necessities—food, clothing, and shelter—the first which confronts him and the most vital to his existence is food. Plants and animals either adapt themselves to find food or perish as life about them changes. Primitive men, using their wits and strength, struggled for their meals in jungles and on plains; and out of this long fierce contest have come many of the inventions and institutions of our civilization.

Today we continue to struggle for food, but instead of seeking it directly, as did our ancestors with club and grub-stick, we find work for which we are paid; and then, if we live in the more favored parts of the world, we may choose what we want from an amazing abundance and variety of good things to eat. Think of the world's appetite, and it is not surprising that about one-half of the world's population is busy day after day supplying food for it. Think, too, of the wonderful system through which we get our food on time and in good condition: ships, rail-ways, and truck lines; stores and ware-houses; grain fields and orchards; ranches and coffee and tea plantations; canning factories and stock-yards; fisheries and flour mills, and how they function (*see Economics*). All these and many other units in the complex network of the world's food supply have come only after many centuries of steady and never-ending struggle.

The Food of Primitive Man

When primitive men were hungry they ate wild berries, nuts, fruits, seeds, and roots; they devoured the raw flesh of small animals and the quiet shellfish, for it took them a long time to learn how to make weapons of stone and wood with which to kill or snare the large animals and the darting fish. In those early days, life was either "a feast or a famine"; they gorged

after a lucky hunt, and they starved when frost nipped the fruits and the grains.

Primitive folk of today live in the same way, consuming vast quantities of food when it is available, and fasting for weeks at a time when it is not. The Veddahs of Ceylon, though they live in a rich, well-watered land, make meals of roots, fruits, bark, leaves,

nuts, fish, small animals, and wild honey. In dry Australia, however, the aborigines seem slightly more advanced, despite an inhospitable land that keeps them hunting constantly for roots, fungi, frogs, bats, caterpillars, cockroaches, grubs, dogs, and kangaroos.

However, the difficulties of the primitive food quest benefited early peoples, for they soon found that a group could work better than a single hunter, and thus they learned coöperation and leadership and tolerance. A notable characteristic of the most primitive peoples is their generosity in sharing their food with any hungry person, even with strangers. Among the Eskimos and other peoples the huntsman takes it for granted that his kill belongs to the community in general.

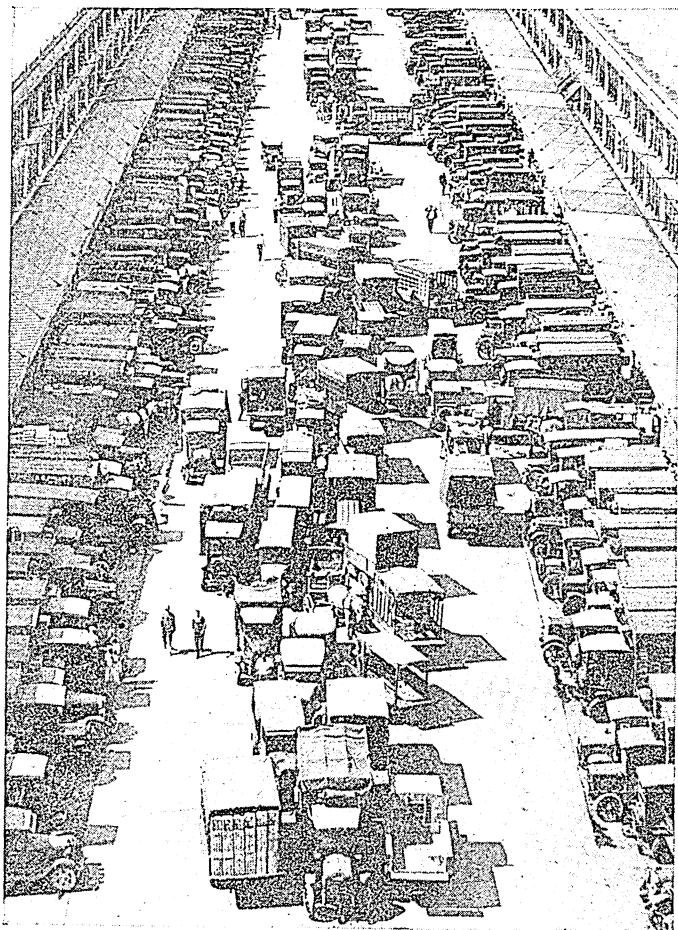
Primitive religions, too, were influenced

by the food search. Our ancestors held mystic ceremonies to bring them good fortune in their fishing or hunting. After they began raising crops they worshiped the earth, the sun, the river, as powers to whom they owed fine harvests.

Taming Animals for Food

Domestication of animals brought about a great change both in food supply and in character. Think of the patience and persistence needed to tame the wild things of the primeval forest! Primitive people guarded their flocks and herds from raiding beasts and envious neighbors. As herders they moved from place

GATHERING FOOD FOR CHICAGO'S MILLIONS



The task of distributing food for the millions crowded into such centers as Chicago and New York is one of the great problems of large cities. Thousands of trucks stream in and out of this immense Chicago produce market every day, carrying away fresh fruit and vegetables for the retail stores.

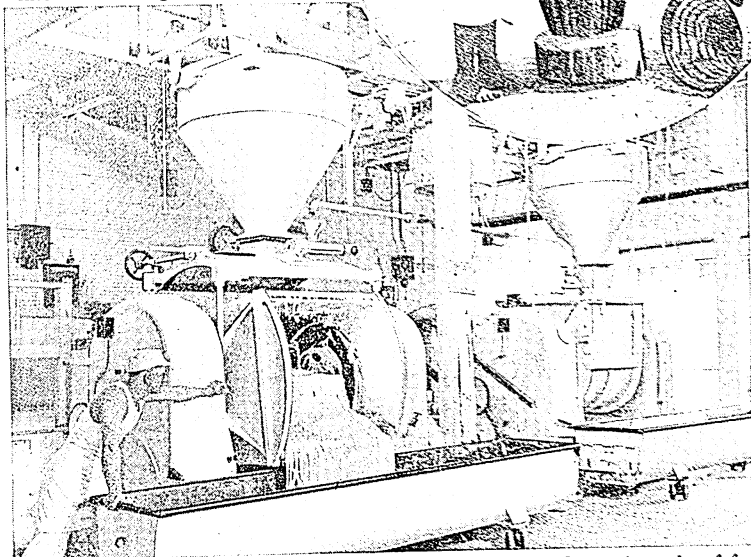
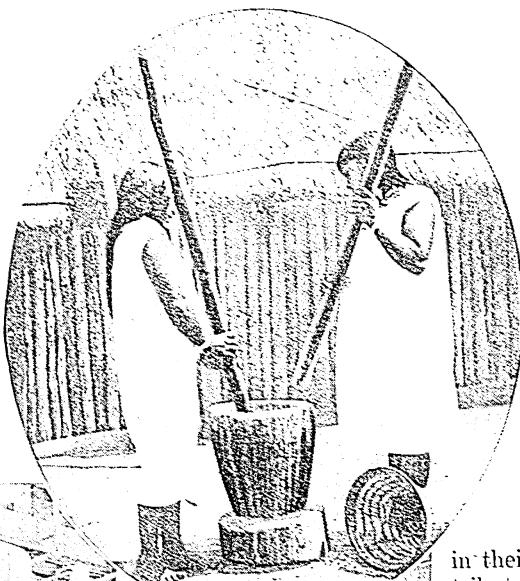
to place to find fresh pastures—a nomad life, but a far more responsible, happier existence than they had known as hunters, for they had learned to control and multiply food supplies.

On up the scale of civilization they moved, by cultivating plants and by changing from hunters or herders to farmers. With herds and crops their food supply was better and steadier than ever before. As hunters, who lived from day to day on whatever they could find for food, they had little need for the sense of ownership, but now, with herds and flocks, they wanted to hold the animals they guarded, the land they cleared, and the food and skins that they stored to tide them over the winter.

From this sense of property rights, authority and

PRIMITIVE AND MODERN BREADMAKERS

Modern bakeries are unknown to these Indian women of Matto Grosso, Brazil, who are pounding corn into meal. While it takes them hours of hard work to make a loaf of bread, the electrical bread mixers below whip barrels of flour into smooth dough in minutes.



law developed. Conflict and war arose from it, and also the building of defenses to protect territorial rights. In wars over fertile farming and grazing lands, some tribes made captives of their enemies, putting them to work on the soil; and thus slavery began.

These farming peoples could live in closer settlements than ever before. Hunters require from five to ten square miles per person; from three to five herdsmen may get their food supply from a single square mile; but agricultural folk use far less land—the amount depends upon their farming methods, the fertility of the soil, the kind of crop, and the rainfall.

In the course of time, our ancestors made discoveries and inventions which are now such common features of everyday living that we sometimes do not realize their great significance. They learned how to cure meats and to make pottery bowls in which they stored dried grains and berries. Their diet was greatly improved by the discovery of fire and cooking. When a grower or a herder found himself with more food than he needed, he learned to barter it for other things

he desired, and so commerce and trade developed.

The struggle for food means more than simply finding enough. People who have developed the healthiest bodies, the keenest minds, and the greatest civilizations have been able to get a balanced food supply that contains a sufficient amount of all the elements the body demands. In the arctic regions, this balance is lacking. The primitive Eskimos live almost wholly on fats and proteins, and their bodies crave the carbohydrates we easily get in vegetables and sweets. Since constant hunger keeps them hunting food

in their barren land, they have contributed little or nothing to civilization. On the other hand, in the tropics, where nature furnishes an abundant supply of carbohydrates, the natives have also failed to develop great civilizations, for they become indolent and will not exert themselves to get the proteins their bodies need.

In the wet monsoon regions rich crops of rice support life for vast populations. China can provide a wide variety of food, but as yet has not developed its great resources. Even today there is comparatively little poultry and cattle raising. The Chinese secure some protein from fish and beans, but lack the acids and the

minerals of fruit, which they consider a great luxury. Rice is the great staple crop, and aside from the health aspects, this lack of variety in diet has two disadvantages: it is monotonous and workers get no pleasure out of it; and if the rice crop fails the nation starves.

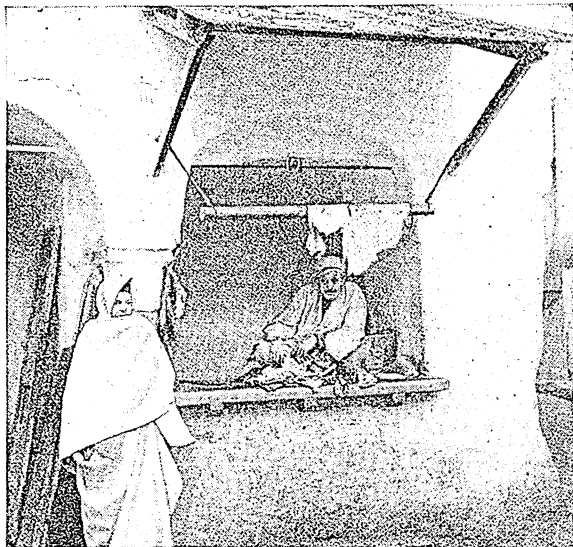
Where the Great Civilizations Developed

Since people can best secure a balanced diet in the subtropics and in the southern part of the North Temperate zone, we should expect the first great civilizations to develop in those regions; and it is true that they did—in Egypt and Mesopotamia. Then nomadic peoples from the less fertile north, lured by irrigated

fields and orchards overran those lands and wrecked much of the culture. (See Migration of Peoples.)

In the East, China protected her civilization by throwing a great wall across 1,500 miles of hill and valley to stop the hungry hordes from the north. Likewise in the West, wave after wave of barbarians from the north swept into the fertile Mediterranean lands in search of a better, easier food supply. The Greeks

A MEAT MARKET IN TUNIS



A snug hole in the wall, a counter slab, and a few pieces of meat hung in the open make up this meat market in northern Africa, where refrigerators and other sanitary devices are unknown.

and the Romans were part of this Indo-European flood, but they in turn were conquered by fresh tribes. The Celts of southern Gaul had an advanced agriculture, while that of their British brothers was more primitive. Most of the food plants we know had their origin in the alkaline soil of central Asia or in the Mediterranean basin, and the most prosperous communities have grown up on soils of this kind.

Wars Over Fertile Lands

The fertile valleys of Greece supplied its population with the principal foodstuffs—wheat, fruit, and oil—until the 8th or 7th century B.C., when there were too many to be fed by crops from the narrow rocky land. Early wars were fought for land and food, and part of the population was sent to colonize Asia Minor, Italy, and Sicily. Increasing stores of grain had to be imported from Pontus, Thrace, Syria, Egypt, Libya, and Sicily. Sparta defeated Athens by destroying the navy that guarded Athenian commerce.

In Rome, constant warfare took farmers from their fields. Great landowners raised luxuries with slave labor, instead of cultivating food crops. Rome imported its wheat, and sent out expeditions to take new lands until most of Europe came under its sway. Colonies went forth to secure this agricultural domain. The cry for grain from Rome's hungry citizens brought "corn laws" to provide cheaper bread; and whenever a politician wished new power he was likely to set up

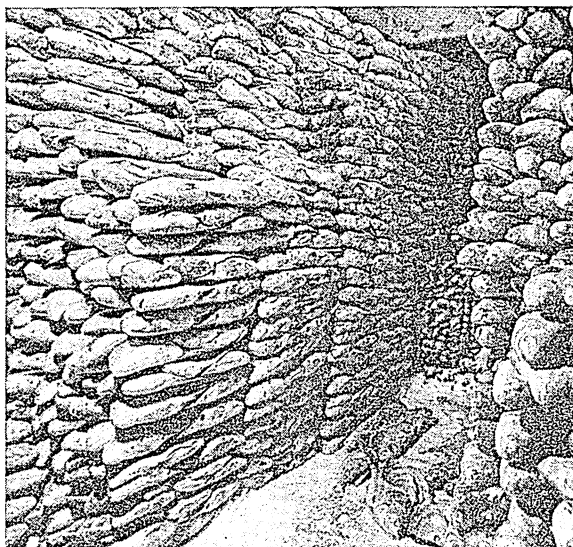
his base of operations in Egypt to secure the grain for the "bread and circuses" he offered the voters.

History abounds in wars over fertile lands. Caesar tells us of the Helvetians, who, finding their mountain valley could not yield enough wheat, poured down into the rich Rhône valley. Many battles have been fought for India's rich acres, the Nile delta, the wheat lands of North Africa, and other rich areas.

As the world has grown in culture and as men have learned to find its wealth, they have improved both their standards of living and their diet. Cooking has made today's meals much more appetizing than the meals of primitive men. Spices from the East played a great part in ancient and medieval cookery, for they preserved foods and covered the flavor of staleness before refrigeration was discovered. Since the Middle Ages, commercial nations have fought for this rich trade, which was held in turn by Phoenicians, Arabs, Venetians, Portuguese, Dutch, and English. (See Spices and Condiments.)

As the nations of the world have prospered and their populations have increased, they have looked for new territory to raise food to fill their growing needs and to provide homes for their colonists. Spain sent

FROZEN FISH IN STORAGE



Tons of Great Lakes fish are packed away in this cold-storage plant at Sandusky, Ohio. Quick freezing and modern refrigeration keep them fresh and unimpaired in flavor for long periods.

Columbus across an uncharted ocean to find another route to the eastern spice countries; then it attempted to spread a vast empire in the New World. England, too, made the northern section of this new land a part of its far-flung empire. Since then, North America has been a haven for people from other overpopulated nations. It offered not only rich acres but also new food plants that have improved the world's diet—potatoes, sweet potatoes, squash, tomatoes, maize, peanuts, cacao, new types of beans, strawberries, and blueberries. Its spreading acres have multiplied the world's available food supply.

Science too has increased the available food supply and enabled the world to support a vastly larger and constantly increasing population. Not only have new areas been brought under cultivation, but the yield per acre has been multiplied by scientific agriculture. Rotation of crops, the introduction of new crops, improved implements, the breeding of superior plants and animals, and the use of fertilizers enable the farmer of today to get more food from the land he tills. And modern transportation takes the food where it is needed.

Before the days of modern farming machinery, food was hard to produce and the whole family worked long hours on the farm at back-breaking labor. Each farmer produced his own food, or much of it, and he made most of the other things he used besides—his few tools, the homespun cloth, and his furniture. The slight surplus that he could produce was hauled to the nearest town in a ramshackle wooden cart over rough roads.

In 1800 comparatively few people were living in towns; in England only 21 per cent of the population lived in towns of 10,000 or more; in France and in Prussia and other German states, less than 10 per cent; in Austria-Hungary, less than 5 per cent; and in the United States 90 per cent of the workers were farmers. Townspeople, while they may have small gardens, do not farm; they manufacture, they transport, and they buy and sell. And so there could not be many large towns in 1800, for there was no easy way to raise the food that they needed and carry it to them. They had to live off the farms just surrounding them, for there were no freight trains to bring food from afar and there were no methods of preserving perishable foods.

The Advent of Modern Machinery

In the 19th century power machinery was invented, and with this advance the whole problem of food supply was changed. Agricultural machinery revolutionized farming methods; it brought about mass production and specialization. The quantity of food which one man could produce was many times as great as it had been before; and, with the new methods of farming and engineering works that drained marshes and reclaimed arid regions, vast new areas were opened to agriculture. Today it takes 40 times as much labor to produce an acre of wheat in machineless India as in the United States. (See Agriculture.)

People released from the farms flocked to the industrial centers, where factories were supplanting the home crafts. But, with increased crop production and new methods of transportation, the problem of feeding the fast-growing cities was no longer a formidable one.

The cities themselves began to do their part in food supply, for large meat-packing houses, canning factories, flour mills, sugar refineries, and innumerable other industrial establishments concerned with the manufacture of food products grew up; and a vast number of people became engaged in marketing foods.

Inventive genius and enterprise have helped in many other ways in the gigantic task of feeding the world. For instance, the perfecting of canning and dehydrating

processes has made perishable fruits, vegetables, and fish available at all seasons. The refrigerator car and ship transport many fresh foods to distant places. Methods of fast freezing at very low temperatures are now employed to preserve the flavor and quality of perishable foods that were destroyed by gradual freezing methods. (See Canning Industry; Dehydrated Food; Refrigeration.)

In this new age people and nations have become more and more dependent on one another for their food. The farmer is just as dependent upon the city as the city is upon him. He has learned to specialize and there are wheat farms, dairy farms,

truck farms, etc. With the money from the sale of his products he buys from the city manufactured goods and such products as his farm does not supply.

The Need of Exporting

In a large country like the United States the agricultural areas could feed the industrial sections with little help from the outside, but the farmer is dependent upon the needs of other nations for a market for his surplus crops. Then, too, as civilization advances people want ever-greater variety in their diet. Today there are millions of people in the United States who demand many foods which are imported from other parts of the world; for example, cocoa, coffee, tea, coconuts, tapioca, spices, and bananas. Other foods, such as sugar, rice, dates, figs, honey, mushrooms, lemons, we produce, but in amounts too small to satisfy our needs. Crowded Europe, on the other hand, must call from afar for its actual necessities. The wide spaces of North America, Australia, and Argentina send wheat and meat half way across the world; the chill waters of the north contribute most of the world's fish supply; and hundreds of other products find distant hungry markets.

The national dishes that the people of various lands enjoy have often come from the limitations of the food supply in these countries. The Scandinavian peoples, for example, have created many delicious fish dishes because their fisheries are so productive. Many of the dishes which we consider typically American are made from native plants and animals, such as

MEALTIME IN JAPAN



This Japanese boy eats rice with chop-sticks at every meal. His people have learned to use unpolished rice, for the vitamin B contained in the germ and outer skin prevents beri-beri.

corn on the cob and corn bread, strawberry shortcake, pumpkin pie, cranberry sauce, canvasback duck, and turkey. Diet in America has been enriched by the favored dishes of our many mingled peoples.

Today knowledge of food values and food needs helps us to know what should be bought with our

food dollars. Articles in newspapers and magazines, talks over the radio, advice on home economics, and courses in nutrition at schools and colleges teach us to make our meals more healthful and appetizing. (For detailed study of this subject see the Reference-Outline on Sociology.)

Foods to Build and Maintain Healthy Bodies

EVERY time you wink your eye, or move your arm, or take a breath, you are using the energy provided by food you ate some time in the past. Our foods supply the energy for the movement of our bodies just as gasoline supplies the energy for moving an automobile. They also furnish

the fuel that keeps our bodies warm. Our bodies are constantly losing heat, and they would soon become cold if we did not keep supplying them with fuel in the form of food.

If we compare our bodies to an engine we shall see how very important our foods are. Furnishing the fuel to run the engine is only one of their tasks. In addition to this, foods build up the materials of which the engine is made, they repair the parts as they wear out, and they furnish the lubricating oil that makes the engine run smoothly. In other words, foods help us to grow; they give us strong teeth, bones, and muscles; and they make red blood. They build up our tissues as they wear out. They keep up the fuel supply that gives us energy and provide fuel reserves which we store up in the form of fat. They also keep our body engines regulated by supplying minerals and roughage and other materials needed to make them run smoothly.

Some of our foods are chiefly valuable as fuel producers; others are good body builders; and still others are needed primarily as regulators. Many foods that we eat help in all three of these tasks. By analyzing foods chemically, scientists are able to tell us just what work is performed by different foods; that is, what *nutrients*, or nourishing materials, they contain. They can also tell us just how much of each of these

FOOD HINTS FOR GROWING CHILDREN

Drink one quart of milk every day.
Eat bread and cereals every day.
Eat fruit and vegetables every day.
Do not eat sweets except at the end of a meal.
Drink at least six glasses of water every day.
Do not drink coffee or tea at all.
Eat regularly three times a day.
Do not eat between meals—except an occasional light luncheon halfway between two hearty meals.
Eat slowly—chew your food thoroughly.

and minerals are important in body building and repair work. Minerals and vitamins play an essential part in regulating the body. Another important body regulator is water.

Our Fuel Needs and the Foods that Supply Them

The more active we are, the more fuel our bodies use. Children use more food than do adults, in proportion to their sizes. Adults

who work or play hard use more than inactive persons. Furthermore, the larger and heavier the body, the greater the amount of fuel used in moving it. A large man requires more food than a small one, an adult more than a child. Boys and girls of high-school age, who are growing rapidly toward their full size and who are very active, require more fuel than do children or adults. In cold climates our bodies lose heat rapidly; consequently people in cold countries need more food than people who live in warm lands.

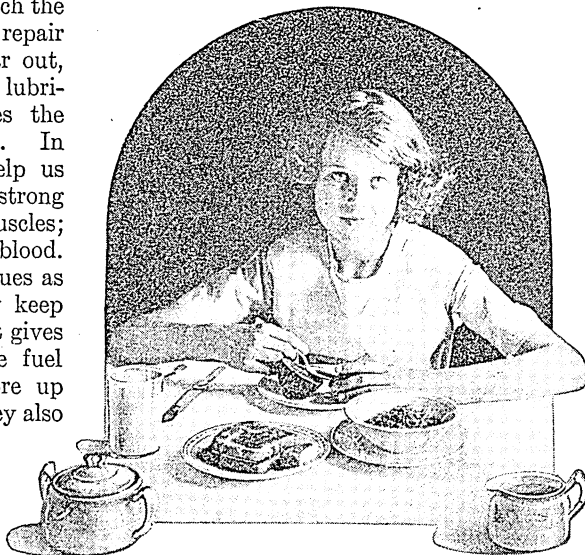
The amount of heat contributed by the various foods is measured in *calories*, as weight is measured in pounds.

A calorie is the amount of heat required to raise the temperature of a kilogram of water (about a quart) one degree Centigrade. While an eight-year-old child may require 1,500 calories of food each day, a high-school boy may need as many as 4,000 calories and his father perhaps only 3,500.

Fats: The Greatest Fuel Foods

Foods vary in the amount of heat they give off in the body. Have you ever seen oil or lard burn? If

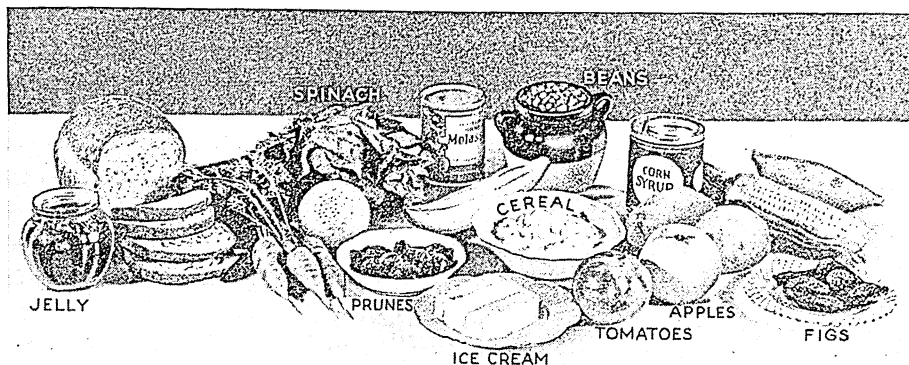
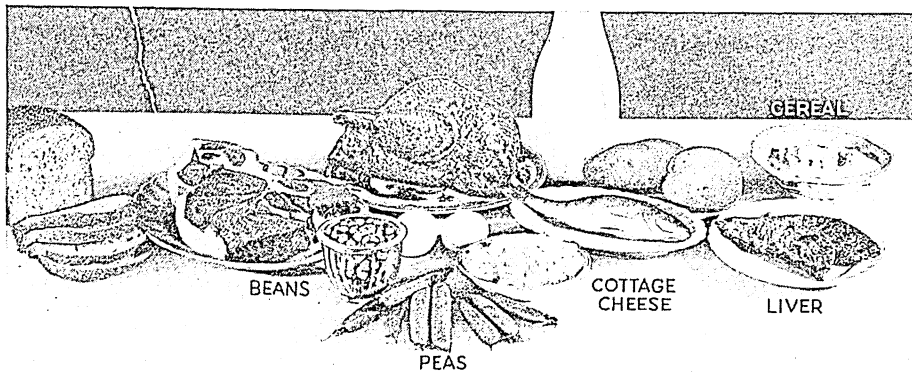
THE RIGHT KIND OF BREAKFAST



As pretty as a sunbeam, isn't she? One reason she looks so bright and happy is that she has the right things for breakfast. Notice the orange, the oatmeal, the rich top milk for the oatmeal, the plain milk for drinking, the toast, and the butter.

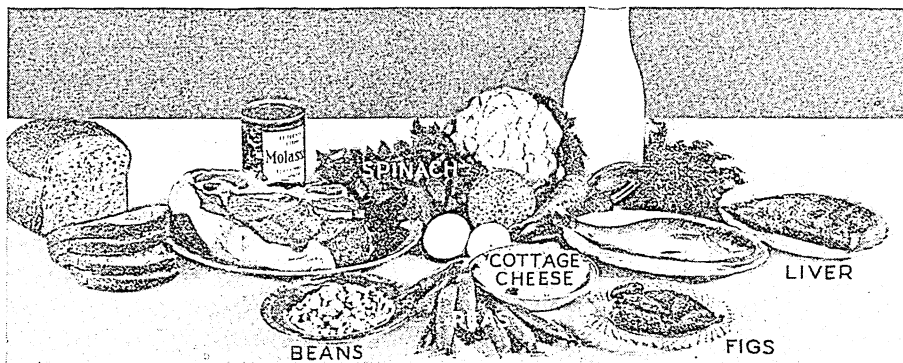
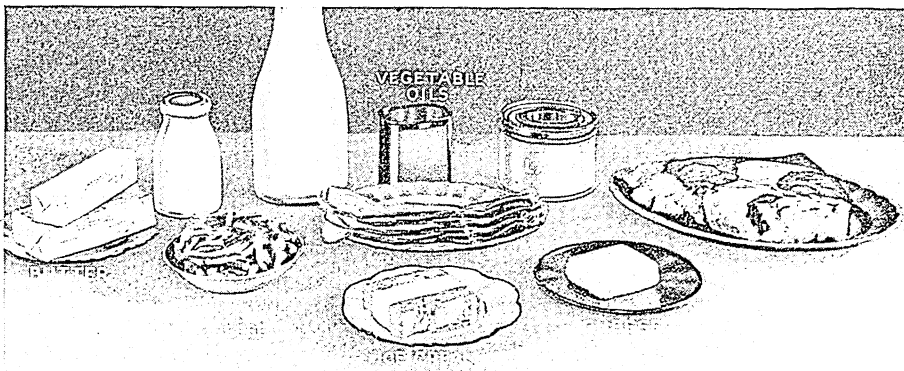
SOME OF THE FOODS WE NEED FOR HEALTH

Proteins: Body Builders.—Some of the most valuable sources of animal proteins are chicken, beefsteak, fish, eggs, liver, and cheese. Among the foods rich in vegetable proteins are whole-wheat bread, beans, peas, potatoes, and whole-grain cereals. Animal and vegetable proteins are not exactly alike, and our bodies need some of each. Animal proteins are more easily digested than the vegetable proteins.



Carbohydrates: Energy Makers.—Jelly, bread, carrots, spinach, bananas, oranges, apples, prunes, cereal (with sugar and cream), baked beans, molasses and corn syrup, white and sweet potatoes, corn, tomatoes, figs, and ice cream are all good sources of carbohydrates. These food elements are turned into energy by our digestive systems. Many of the carbohydrate foods also give us the roughage we need.

Fats: Heat and Energy Makers.—This picture shows some of the foods that contain fats, and some of the ways in which we blend them with other foods, for the fats are seldom eaten alone. Butter, lard, cream, olive oil and other vegetable oils are among the commonest fats in our diet. Milk contains fat as well as other food elements. Bacon and steak provide both fats and proteins. Ice cream is a good fuel food.



Minerals: Bone, Teeth, and Muscle Builders, and Body Regulators.—These foods supply generous amounts of the minerals which help to build our bones, muscles, and teeth, and give us red blood. Milk is the best source of calcium and contains almost all of the other minerals we need. Iron, iodine, and phosphorus are among the minerals supplied by the other foods. Many foods on this page are rich in vitamins.

TABLE SHOWING THE FUEL VALUE OF SOME COMMON FOODS

| Food | Calories, per pound (or per pint of fluid) | Food | Calories, per pound (or per pint of fluid) |
|-----------------------------|--------------------------------------------|------------------------------------|--------------------------------------------|
| Fruit: | | Meat Products: | |
| Grapefruit and Oranges..... | 170 | Oysters..... | 228 |
| Apples..... | 214 | Chicken..... | 289 |
| Bananas..... | 290 | Lean Beef..... | 617 |
| Dates..... | 1,575 | Veal..... | 683 |
| Vegetables: | | Sausage..... | 1,061 |
| Cucumbers or Lettuce..... | 83 | Smoked Ham, Lean..... | 1,209 |
| Cabbage..... | 143 | Mutton..... | 1,543 |
| String Beans..... | 176 | Moderately Fat Beef..... | 1,721 |
| Peas..... | 252 | Bacon..... | 2,836 |
| Potatoes..... | 302 | Granulated Sugar..... | 1,814 |
| Baked Beans..... | 583 | Milk (whole)..... | 314 |
| Cereal Products: | | Milk (condensed, sweetened)..... | 1,480 |
| Bread..... | 1,284 | Thick Cream..... | 1,727 |
| Rice..... | 1,591 | Eggs (an egg weighs 2 ounces)..... | 594 |
| Macaroni..... | 1,625 | Honey..... | 1,481 |
| Shredded Wheat..... | 1,660 | Butter..... | 3,491 |
| Crackers..... | 1,835 | Cottage Cheese..... | 448 |

A GENERAL PLAN FOR CHOOSING FOOD FOR A DAY

In this chart, a cross indicates that a food contains the element under which it is listed in sufficient quantity to be of value in the diet. Under each element at least one "excellent" or two "very good" food sources are given. You will notice that if milk were omitted, there would be a shortage of calcium and that fresh uncooked fruit is very important as a source of Vitamin C. You may substitute rice or macaroni for potato occasionally and you may use the milk as a beverage, on cereals, or cooked in foods. Occasionally waffles or muffins may replace the cereal. Cheese may be substituted for meat; other foods, such as nuts, may be added.

| Food | Amount | Fuel | Protein | Calcium | Iron | Vitamins | | | Roughage |
|----------------------------|----------------------------------------------------|------|---------|-------------|------|----------|----|-----------|----------------|
| | | | | | | A | B | C | |
| Milk..... | Children, 1 quart Adults, 1 pint | xx | xx | xxx | — | xx | xx | x | — |
| Potatoes..... | 1 serving | xx | x | — | xx | x | xx | x | without peel — |
| Meat or Fish..... | 1 serving | xx | xx | — | x | xx | xx | — | x |
| Egg..... | 1 each day is best—at least several per week | xx | xx | x | xx | xxx | xx | — | — |
| Fresh Uncooked Fruit..... | 1 serving—2 would be better; citrus fruits often | x | — | x | x | x | x | xxx | xx |
| Other Fruit..... | 1 serving | x | — | x | x | x | x | x | xx |
| Green Leafy Vegetable..... | 1 serving { a vegetable should be served raw often | — | — | x | xx | xx | x | if raw xx | xx |
| Another Vegetable | 1 serving { a third vegetable would be good | x | — | x | x | x | x | — | xx |
| Bread..... | 3 servings—whole-grain breads usually | xx | — | whole gr. x | x | x | xx | — | whole grain xx |
| Whole Cereal..... | 1 serving | xx | — | x | x | x | xx | — | xx |
| Butter..... | 2 or 3 pats | xx | — | — | — | xxx | — | — | — |

xxx=excellent source

xx=very good source

x=has some

—=has little or none

you have, you will remember that they gave a very hot flame. Similarly the fats in our bodies, such as butter and oils, give many calories of heat. They are the greatest heat-producing foods. The fats occur in both animal and vegetable foods. Butter, cream, lard, and the fat of meat are typical animal fats. Olive oil and cocoa butter are vegetable fats. (See Fats and Oils.) When we eat more of the fats than we immediately need for energy, the excess is stored in our bodies as fat. It is deposited as a layer of fat just under the skin, covering the bones and filling out the hollows between the muscles, and at various places about the organs within our bodies. That is why we can live for some time without food. We use our reserve fat for energy. Primitive peoples, whose food supply was often very irregular, could survive times of famine by using up the fat that they had stored in their bodies during the days when food was plentiful. Even today, when most of us have three meals a day, we call upon our reserve fuel supplies when we are ill. Perhaps you have seen someone who grew thin during a prolonged illness.

The fat we store up serves another purpose besides that of a reserve fuel supply. It helps to keep our organs in good working positions and forms a padding for nerve centers, thus keeping us from being irritable. To be thin is a great disadvantage, especially for young people. On the other hand, a considerable degree of overweight in middle-aged persons shortens the number of years they can expect to live. If we habitually maintain about the weight that is normal for us, we can be certain that we are taking in the proper number of calories.

Carbohydrates: Another Type of Fuel Food

The carbohydrates, which are chiefly the sugars and the starches, are also heat producers. Sugar, in particular, is a better fuel for muscular work than is fat. The carbohydrates, however, contain only about 1,820 calories to the pound, whereas the fats average 4,080 calories. In other words, the fuel value of the carbohydrates is less than half the fuel value of the fats. This class of foods, which includes cereals, bread, potatoes, and certain other vegetables, forms the bulk of our diet.

Proteins: Both Fuel and Building Materials

While the protein foods, such as eggs and lean meat, also supply fuel for the body, their most important service is in building and repairing its tissues.

Everyone is born with the possibility of growing to a certain height, and nearly everyone has the possibility of developing a healthy body. Whether we grow as strong and tall as our inheritance allows depends upon a number of things. It depends, for one thing, on whether we supply the right kind and amount of materials for building our bodies, for our bodies are made of the same substances as are our foods.

Since the body cannot manufacture any of these building materials, they must all be supplied. For growth and repair of tissues the body must have a

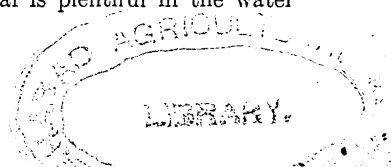
constant supply of protein. Protein, for example, is used largely in the building of the muscles. If our foods do not contain enough protein, our muscles will either be smaller than they might be or they will be of poor quality. Though proteins are found in both animal and vegetable foods, they are of different kinds, and not all of them are equally nourishing. Meat contains the highest percentage of protein. Milk, eggs, sea foods, cheese, nuts, navy beans, peas, and cereal products are other foods that contain a large amount. (See Proteins.)

Foods That Supply Minerals

Minerals are widely distributed among our foods, and almost any mixed diet supplies a sufficient quantity of the minerals that our bodies need. Two important minerals, however, may not be contained in sufficient quantity in our ordinary diet, and we must have them in mind when we select our foods. One of these is lime (calcium). If we do not get enough lime, our bones will be small and weak and perhaps misshapen. Our teeth will be of poor quality, and our blood will lack an essential element. Milk is the one rich source of calcium. Every child needs a quart of milk a day; an adult normally requires from a glass to a pint, depending on what other foods he eats. Since milk is used in the preparation of ice cream, soups, creamed vegetables, and other dishes, such foods help to supply our milk requirements. Egg yolk and cheese contain more calcium than do most foods; some vegetables contain small amounts. Meat is poor in calcium. We would need 12 pounds of meat and 4 loaves of bread daily to supply our calcium needs if these were the only foods we ate. Since we all wish to have strong bones and sound teeth, we must not neglect milk in our diet.

Iron is another mineral to keep in mind. If we get too little iron, our blood will not be of a rich red color, and it will not be able to do its work of carrying oxygen to all parts of the body. As a result, we will become anemic and weak. Liver, egg yolk, molasses, whole wheat, navy beans, peas, prunes, and spinach are rich in iron. Lean meat, if the blood has not been washed out of it, is an excellent source of iron. Recent studies show that not all of the iron in foods is available for use in the body. Scientists tell us, for example, that only 25 per cent of the iron in spinach is usable, whereas 60 per cent of the iron in liver and 50 per cent of the iron in beef is available for use. It has also been found that copper as well as iron is necessary for building the coloring matter, or *hemoglobin*, in our red blood cells.

Two other minerals, phosphorus and iodine, are lacking in some diets. If we get enough protein, we need not worry about phosphorus, for most foods that contain protein also contain phosphorus. Like calcium, this mineral is used for bones and teeth. Iodine is needed by the thyroid gland, an important gland in the neck (see Gland). In most parts of the United States this mineral is plentiful in the water



and in the soil, and the normal diet contains enough of it. But in regions far from the sea it is often lacking and must be supplied by including such foods as sea foods or iodized table salt in the diet. In the Great Lakes region of the United States many people are afflicted with goiter, an enlargement of the thyroid gland, because their diet does not contain a sufficient amount of iodine (*see* Iodine).

Even when we are grown, our diet must include all of the building materials, since each day small quantities of them are lost. The body is constantly breaking down and being repaired, and if the repair materials are not at hand, bones, muscles, teeth, and all other tissues gradually deteriorate. Children as well as adults need these repair materials.

The Body Regulators and How They Serve Us

Chief among the body regulators are the vitamins, which must be in the diet for proper nourishment. Even though we supply the fuel and the building materials, the body cannot use these satisfactorily without the vitamins. We know little about what the vitamins are and how they work, but we do know what foods are rich in vitamins and what happens when we do not get enough of them. We know that vitamins help us to grow and protect us against such diseases as beri-beri, scurvy, and rickets. (*See* Vitamins for a discussion of the foods that contain them and of their importance to our health.)

Few persons in the United States are in danger of contracting the acute diseases that result from a severe shortage of vitamins. Many, however, have obscure ailments that probably are caused by failing to get quite enough vitamins for abundant health. Tiredness, irritability, weakness, and frequent colds and other infections may be evidence of such a condition.

Cellulose is needed in the diet to keep our digestive organs working satisfactorily. Cellulose is the "roughage," the coarse indigestible fibers, found in vegetables such as green beans and celery, in the bran of the whole-grain cereals, and in the skins and pulp of fruit. Green vegetables and fruit are the best foods to eat for roughage because they supply minerals as well.

Although many of our foods contain water, we need to drink at least six glasses of water a day to keep our bodies working smoothly. Water makes up nearly two-thirds of our weight. We use it in breathing, and also to throw off waste by perspiration and through the kidneys and bowels.

The Importance of a Balanced Diet

By supplying the right kinds of foods in the right proportion—that is, by a "balanced diet"—we give our bodies an opportunity to serve us well from childhood until we are old. When we fail in any respect, we may be sure that in the long run we shall suffer for it. During the World Wars many people in Europe suffered from malnutrition (faulty nutrition) because they lacked the right kinds of foods. Children failed to grow properly and their little bodies

were badly misshapen. Some persons are badly nourished in the midst of plenty because they do not know what foods to choose. Some have finicky appetites and neglect one or more of the important foods. The person who enjoys all of the common foods is fortunate.

Finally, we must remember that the method of cooking food plays almost as important a part in getting proper nourishment as the selection of the food itself. Some important food constituents dissolve in water, and so may be lost unless care is taken to preserve them. This applies to most fresh vegetables, and for this reason they should be cooked in as little water as possible and the water in which they have been boiled should be served with them. Careless cooks often throw away the most nourishing parts of a dish. Greasy fried foods, rich gravies, and rich pastries, while they are energy-producing foods, should be avoided because they are difficult to digest. (*See* Cooking.)

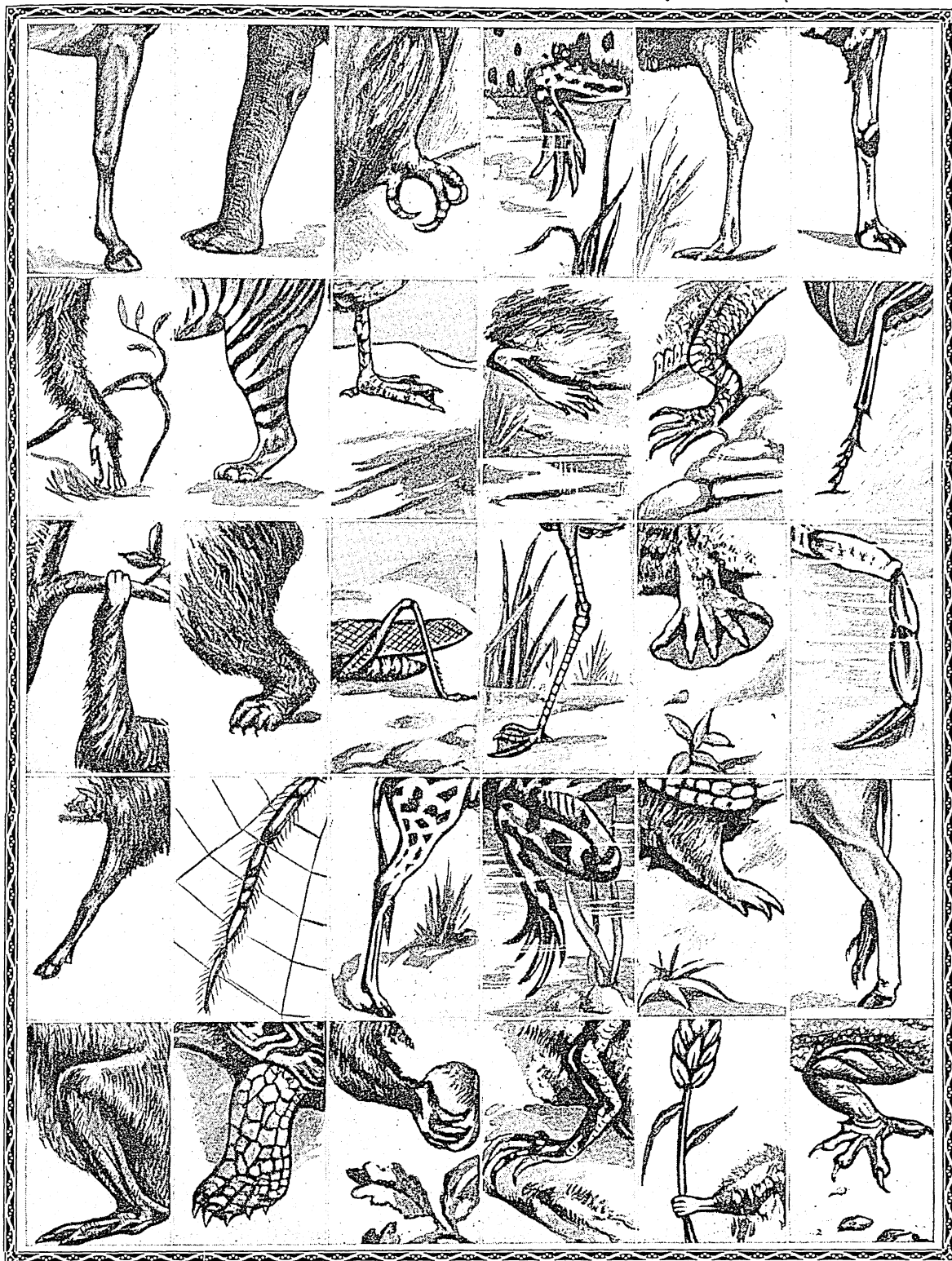
FOOT. In the simplest forms of animal life we do not find special organs for locomotion. In one-celled animals, such as the amoeba, a bit of the living substance is pushed out and then the remainder of the body is pulled up to it. The movement of the worm is somewhat similar; one section of the body is thrust forward and then the other parts are brought up by a creeping or crawling motion. As we ascend the scale of animal life, we find definite organs developing to move the animal about. These organs, which we call feet and legs, occur most commonly in pairs of two, four, or six.

Comparison of the foot in various animals shows many interesting adaptations. In the human foot we distinguish the ankle (*tarsus*), the instep (*metatarsus*), and the toes (*phalanges*). The heel rests upon the ground, making what is called a "plantigrade" foot. The bear also has such a foot. Other animals, like the cat and dog, walk on their toes, or digits. They are said to have a "digitigrade" foot, with the heel up in the air and the instep lifted away from the earth. In deer, cattle, horses, and some other animals, the elevation of the heel has been carried further, and the animal stands on the tip-end of a single toe; the heel, instep, and digits are then away from the earth and only the tip-end of one toe is in contact. Animals with the digitigrade foot are much swifter than those with the plantigrade type.

The horse has the most remarkable example of a modified foot. Not only are the heel and instep off the earth, but the bones of the instep have become reduced to one, and the animal walks upon the tip of a single toe on each of his four feet. Fossils found in rocks show that the horse's foot has been derived from that of an original five-toed ancestor, by suppression and consolidation of parts. It is estimated that these changes in the horse's hoof extend over a period of geological history of more than 40 million years. (*See* Horse.)

The animals which have feet most nearly resembling

THIRTY FEET! HOW MANY DO YOU KNOW?



Just as a good shoemaker makes shoes to fit the feet, Nature makes feet to fit the needs of each individual animal. How many of these feet could you name? They are, from left to right, first row—Horse, Elephant, Eagle, Newt, Ostrich, Camel; second row—Chimpanzee, Tiger, Duck, Water Shrew, Lizard, Tiger Beetle; third row—Sloth, Bear, Locust, Flamingo, Duck-billed Platypus, Crab; fourth row—Peccary, Garden Spider, Giraffe, Frog, Armadillo, Ox; and fifth row—Kangaroo, Box Turtle, Squirrel, Iguana, Harvest Mouse, Gecko.

those of man are the monkeys and apes. But their feet are more like hands, for the great toe can be used like a thumb, and there are no arches in their feet, such as man has developed.

The human foot is beautifully adapted to the work it has to do. Its many small parts, like those of a delicately balanced machine, are perfectly coordinated and adjusted to bear the weight of the body and to carry us over the ground. It has 26 bones (*see Skeleton*). Held in place by ligaments, tendons, and muscles, the bones form two main arches—one from heel to toes, called the *longitudinal arch*; the other across the instep, called the *transverse arch* or *mediotarsal arch*. These give the foot strength and support the body's weight. The longitudinal arch adds spring to the step. It rests on thick muscle, which softens the jolting as the weight of the body is shifted from one foot to the other in walking or running.

The movement of the foot is largely controlled by the muscles of the lower leg, which are attached to it by tendons passing through the ankle. The ankle, above the heel, has a joint which acts as a hinge between leg and foot. The toes are jointed, so that the

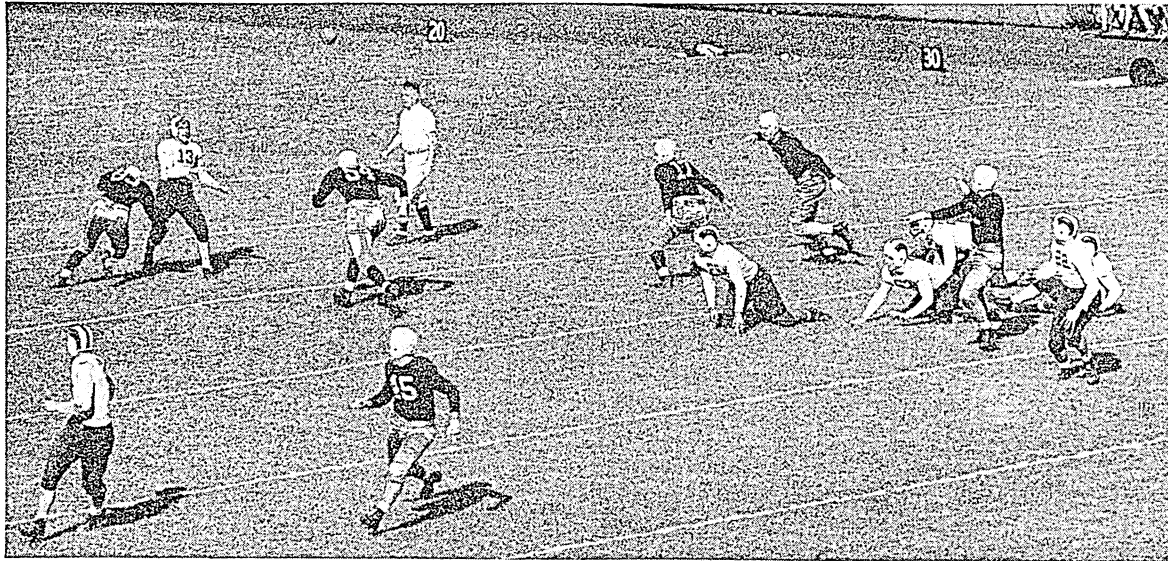
foot bends easily and the motion of walking is almost as smooth as the rolling of a wheel.

In walking one should point the feet straight ahead and shift the weight from heel to toes in such a way as to give one the feeling that the toes are gripping the ground at the end of each step.

No machine deserves better care than the foot. It should be rested frequently and bathed daily. Stockings that are smooth, well fitted, and free of darns help prevent blisters, calluses, and corns. Shoes should be fitted with extreme care. A good shoe has a straight inner line, a flexible inner shank, a broad toe, and a broad low heel. An ill-fitting shoe may cause bunions or even dislocate bones. The condition called "broken or fallen arch" is really a displacement of the bones of the arch. It is sometimes incorrectly called "flatfoot," which is a permanent deformity of the bones of the foot, originating in infancy or peculiar to certain racial types.

The foot as a measure of length comes from the assumed length of the human foot, and is very old. The Greek foot was 12.45 inches long, the Roman, 11.65 inches, and the French, 12.8 inches.

SPORT and STRATEGY of the GRIDIRON



The forward pass has helped to make football a favorite game of millions of spectators because it provides a fast, open style of play, easy to watch. Above, player No. 13 is hurling a perfect pass to player No. 22, at the extreme right.

FOOTBALL. The king of autumn sports in the United States is football. It holds sway from the close of the baseball season until basketball begins. No game demands more teamwork, strength, courage, and alertness, or provides a more thrilling spectacle—and few games have as lively a history.

Football is the chief sport in most colleges and universities as well as in thousands of secondary schools. It is also played by teams representing cities, playgrounds, and industrial organizations, as well as by teams of professional players. Its legions of players, however, are but a handful in comparison

with its spectators. The millions of dollars spent each year for tickets to football games have built mammoth stadiums. Those at the University of California, Stanford University, the University of Michigan, and Yale can each seat 70,000 persons or more. City stadiums, too, are used for football. Soldier Field in Chicago, the Philadelphia Municipal Stadium, and the Los Angeles Coliseum each hold more than 100,000. The Rose Bowl at Pasadena, Calif., can seat about 80,000.

The name "football" has been used for several different games, including soccer and Rugby. These will

PLAYS IN AMERICA'S MOST POPULAR COLLEGE SPORT

INTERFERENCE

2-ARM NEAREST
OPPONENT FORWARD

4-ROLLS
THROUGH,
CUTTING
HIM
DOWN



1-TOP SPEED

3-THROWS
WHIRLING
BODY ACROSS

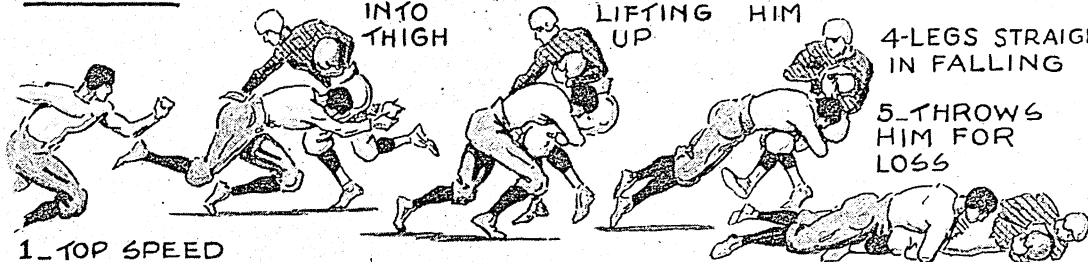
TACKLING

2-SHOULDER
INTO
THIGH

3-DRIVES FORWARD,
LIFTING HIM
UP

4-LEGS STRAIGHT
IN FALLING

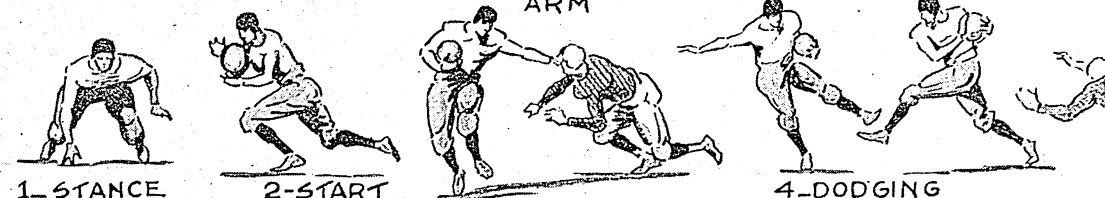
5-THROWS
HIM FOR
LOSS



1-TOP SPEED

RUNNING THE END

3-USING STRAIGHT
ARM



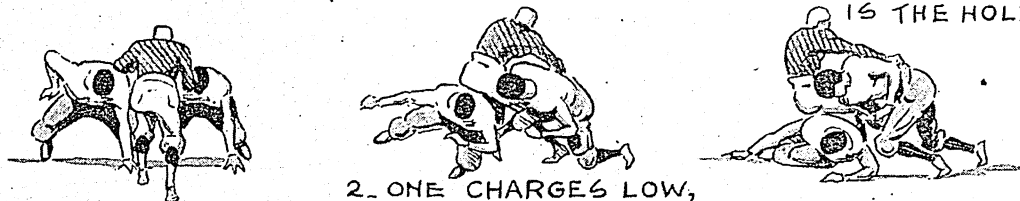
1-STANCE

2-START

4-DODGING

OPENING HOLE IN LINE

3- OVER HE
GOES-HERE
IS THE HOLE



1- TWO AGAINST ONE

2- ONE CHARGES LOW,
THE OTHER HIGH

BUCKING THE LINE

3- RUNS OVER
PILE OF PLAYERS

5-WHIRLS
TO SIDE TO
GAIN MORE
DISTANCE

1-HEAD UP,
LEG UNDER
BODY

2- NO
OPENING

4- DRIVES LOW
AT TACKLER



Ed McJannet

Our first pictures show one sure way of helping your side advance by dropping a foe who is dashing to stop your ball carrier. A hard, driving tackle that seldom fails to stop a man is pictured next. Then we see one of football's most spectacular plays, the end run, and the straight arm and dodging aids to open field running. The fourth strip shows how two linesmen may open a hole in the rival line through which a teammate may advance the ball. Finally we have the smashing line-buck, with the leap over the line and the whirling fall which often add precious feet or yards to a gain.

be described later in this article. But to most people in the United States the word means the game that has been developed by American colleges. In other countries this is called "American football." Its rules are made by the Rules Committee of the National Collegiate Athletic Association.

Field and Equipment

Football is played on a rectangular field crossed at 5-yard intervals by lines, which give it the appearance of a gridiron. (For dimensions and markings, see diagram.) At each end of the field is a goal. This stands 10 yards behind the goal line (on the goal line in professional football) and consists of two uprights 18 feet 6 inches apart and more than 20 feet tall, with a crossbar 10 feet from the ground.

The ball consists of a leather cover inclosing a rubber bladder inflated to a pressure of from $12\frac{1}{2}$ to $13\frac{1}{2}$ pounds to the square inch. Its shape is oval with a circumference of from $21\frac{1}{4}$ to $21\frac{1}{2}$ inches around the middle and from 28 to $28\frac{1}{2}$ inches around the ends. It weighs from 14 to 15 ounces.

Teams Line Up for Battle

The game is played between two teams of 11 men each. Team positions are as follows: *line*—left end, left tackle, left guard, center, right guard, right tackle, right end; *backfield*—quarterback, left halfback, right halfback, fullback. During the game any player may be replaced by a substitute.

Before the game starts, the referee tosses a coin in the presence of the opposing captains to determine which side will kick off and which side will receive. The winner of the toss has the choice of kicking off or receiving, or the choice of goals. The side that kicks off must be behind the ball until it is kicked.

As soon as a man on the receiving side catches the ball from kickoff, his teammates form *interference* to prevent the opponents from *tackling* him, for the object of the team with the ball is to advance it as far as possible toward the opposite goal line. (For illustrations of interference and tackling, see page 149.) When the ball carrier has been stopped, the teams line up facing each other for *scrimmage*. The ball is put into play again when the center of the team having the ball passes it or snaps it back between his legs. A team must advance the ball at least 10 yards in no more than four tries or *downs* from scrimmage. If it fails, the ball automatically goes over to the other team, which then has four downs in which to do likewise.

The team in possession of the ball carries on its offense in one of the following ways:

Running with the Ball. It has one of its men, usually a backfield man, carry the ball through or around the opposing line. The quarterback decides in advance whether the play is to go through center, off tackle, or around one of the ends. Then the ball-carrier's teammates try to open a hole in the opposing line and to run ahead of him as interference. Line plays offer the safest way of making moderate gains of ground.

Passing the Ball. One of the backfield men, after receiving the ball from the center, throws it to a teammate who attempts to catch it and run with it. The ball may be thrown backward or to the side (lateral pass) without restrictions, but if the throw carries the ball closer to the opponent's goal, it is called a *forward pass* and is subject to definite regulations. The thrower must be standing at least 5 yards behind the line of scrimmage (the professional rules omit this restriction), and the ball may be caught only by those teammates who at the beginning of the play were stationed at the ends of the line or at least one yard behind the line.

Kicking the Ball. Advancing the ball by a type of kick called the *punt* (illustrated on page 151b) is good strategy when the team has failed to gain 10 yards in three downs. The opposing team takes over the ball after the punt, but is usually much farther from the kicker's goal than if the ball had been surrendered because of

failure to make 10 yards by the fourth down. The *drop kick* (illustrated on page 151b) and the *kick from placement*, in which a teammate holds the ball on the ground for the kicker, are used almost exclusively for scoring purposes.

The ball may also be advanced by various penalties against the opposing side for infractions of the rules. A frequent cause for penalty is being *off side*, that is, a forward motion by a player before the ball has been snapped back. This sets the offending side back 5 yards. Another cause of penalty is *clipping*, that is, illegal blocking from behind. This may draw a 15-yard penalty or half the distance to the goal.

How Teams May Score

A team crossing the opponents' goal line by carrying the ball or by completing a forward pass scores a *touchdown* (6 points). This entitles the team to try for an *extra point* from scrimmage on the opponents' 2-yard line. The extra point may be made by place-

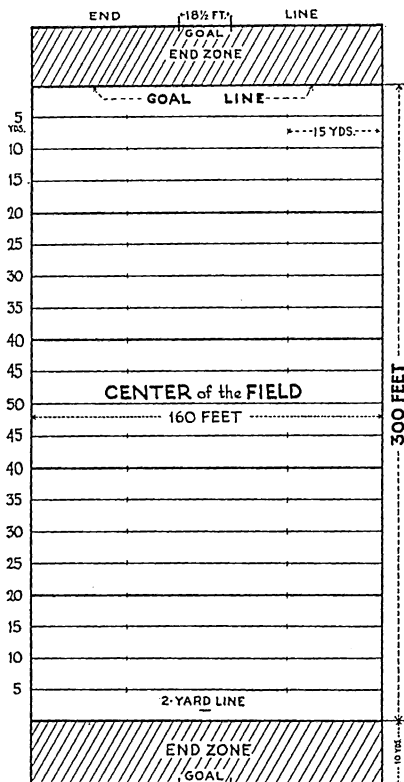
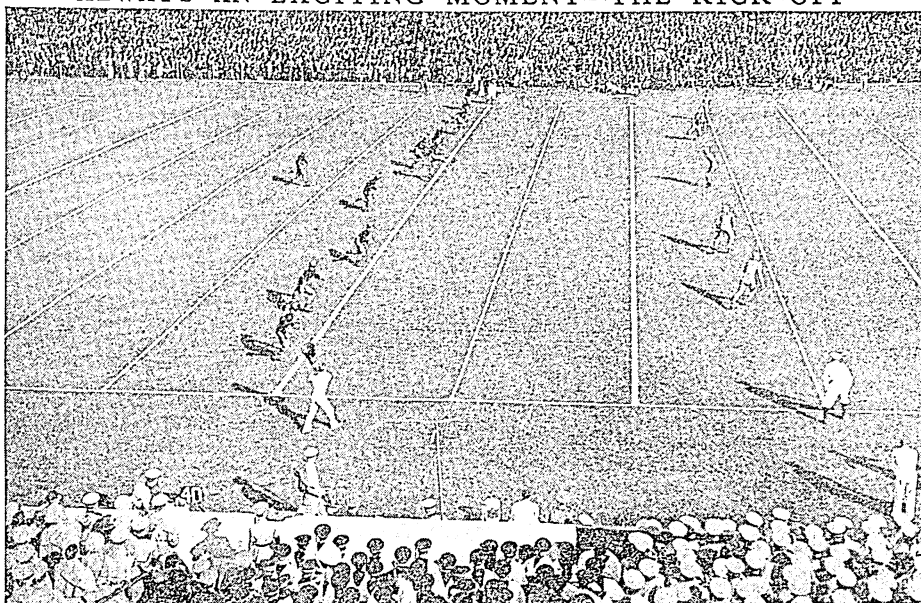


Diagram of a Football Field

ALWAYS AN EXCITING MOMENT—THE KICK-OFF



The man in the center of the line at the left has just kicked the ball. The opposing linemen are moving into formation to protect the player (not shown) who will catch the ball and try to run it back.

kicking or drop-kicking the ball over the crossbar between the goal posts or by forward passing or carrying the ball across the goal line. A *field goal* (3 points), which has no connection with a touchdown, may be scored from scrimmage at any time during the game by place-kicking or drop-kicking the ball over the crossbar between the enemy goal posts. A *safety* (2 points) is scored by the defense when it downs a ball carrier behind his own goal line.

Actual playing time is 60 minutes, divided into quarters of 15 minutes each. Between the second and third quarters there is a 15-minute intermission. A game may last from two to three hours because frequent *time out* is granted for injuries, rest, or conference. High-school games are commonly limited to 48 minutes of playing time, divided into 12-minute quarters.

The officials include a *referee*, who has general control of the game; an *umpire*, who has charge of the conduct and position of the players; a *linesman*, who supervises the marking of the distances gained or lost; and a *field judge*, who times the game and assists the other officials.

Economics of Football

Football in the United States has grown almost to the status of a major industry. Income from intercollegiate football games amounts in some years to an estimated \$20,000,000. Most of this is absorbed by the high cost of the sport. Large sums must be spent each year to maintain and finance stadiums, to pay salaries of coaching staffs as well as of trainers and physicians, to pay traveling expenses, and to buy equipment. A single football uniform may cost as much as \$75, for it must be designed especially to protect the player from bruises and broken bones. A uniform includes a helmet; pads for shoulders, hips, knees, and thighs; pants, undershirt, and jersey; and socks and shoes, the latter with cleated soles to take a firm grip on the turf.

Organization of "Conferences"

Many colleges and universities are members of "conferences" composed of institutions in the same section with about the same football resources and traditional rivalries. The teams belonging to a conference play most of each season's games against other

members of the group, and direct their best efforts toward winning the conference championship. The major conferences with dates of organization are as follows:

| | | | |
|------------------------------|---------------------|-------------------------------|----------------------------|
| WESTERN (1896) | | Furman | Virginia Military Inst. |
| Chicago* | Minnesota | Maryland | Virginia Polytechnic Inst. |
| Illinois | Northwestern | North Carolina | Wake Forest |
| Indiana | Ohio State | North Carolina State | Washington and Lee |
| Iowa | Purdue | Richmond | So. Carolina |
| Michigan | Wisconsin | Virginia | William and Mary |
| ROCKY MOUNTAIN (1909) | | BIG SIX (1927) | |
| Colorado School of Mines | | Iowa State | Missouri |
| Colorado Col. Greeley State | | Kansas | Nebraska |
| Montana St. Western St. | | Kansas State | Oklahoma |
| SOUTHWEST (1915) | | SOUTHEASTERN (1933) | |
| Arkansas | Texas | Alabama | Mississippi |
| Baylor | Texas A. & M. | Auburn | Mississippi State |
| Rice | Texas Christian | Florida | Sewanee |
| Southern Methodist | | Georgia | Tennessee |
| PACIFIC COAST (1916) | | Georgia Tech. | Tulane |
| California | Southern California | Kentucky | Vanderbilt |
| California (Los Angeles) | Washington | Louisiana State | |
| Oregon | Washington State | MOUNTAIN STATES (1937) | |
| Oregon State | State | Brigham Young | Utah |
| Stanford | | Colorado | Utah State |
| SOUTHERN (1922) | | Colorado State | Wyoming |
| Citadel | Davidson | Denver | |
| Clemson | Duke | | |

*Abandoned intercollegiate football 1939.

Eastern institutions have no conference, although Harvard, Yale, and Princeton are called the "Big Three." Other major teams are Army, Navy, Carnegie, Colgate, Columbia, Cornell, Dartmouth, Fordham, New York University, Pennsylvania, Pennsylvania State, Pittsburgh, Syracuse, and Temple. Notre

Dame teams are often called the "Ramblers," because they belong to no conference, but travel widely to battle with the strongest teams of the nation.

Selecting a national champion team each year becomes increasingly difficult because of the number of good teams, the frequent upsets of good teams by mediocre teams, and the impossibility of planning schedules so as to insure games between the best teams. Some consider as national champion the winner of the Rose Bowl game held each New Year's Day at Pasadena, Calif., in connection with the Tournament of Roses. The game is played by the champion of the Pacific Coast Conference and an eastern or southern team selected by it usually from among unbeaten or clearly superior teams.

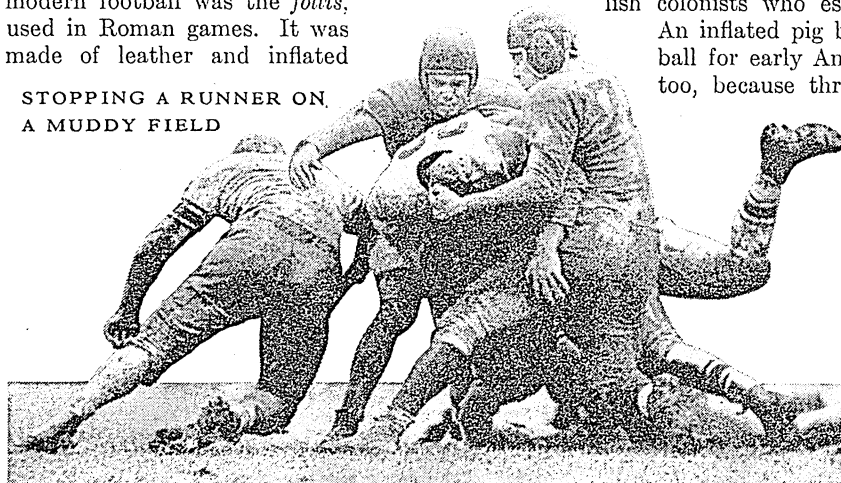
Other "bowl" games have arisen in the South. At New Orleans a Sugar Bowl game is held between a strong team representing the South and one representing the North. Dallas has a Cotton Bowl game; Miami, an Orange Bowl game, and El Paso, a Sun Bowl game.

In San Francisco, a game sponsored by the Shriners for charity is played each New Year's Day between two all-star teams, one made up of players from colleges west of the Mississippi, and the other of players from colleges east of the Mississippi.

Early Ancestors of Football

Football is an ancient sport. A game called *harpaston* was played by the Spartans as early as 500 B.C. In this a ball was kicked, passed, or carried across the opponents' goal line. Strikingly similar to a modern football was the *foliis*, used in Roman games. It was made of leather and inflated

STOPPING A RUNNER ON
A MUDDY FIELD



A sculptor might have designed this group of players snapped during a game in the rain. The man in the center is carrying the ball and has driven head first into the enemy line, where two men are pulling him down, while the man at the left is trying to block the hole.

with air, but it evidently was propelled not by foot, but by hand and arm.

A game called *calcio*, a modified form of *harpaston*, enlivened medieval tournaments in Italian cities. The players, 27 on a team, used line and backfield formations not greatly unlike those of football today. Princes, soldiers, and "the noble ladies and the people" cheered for their favorites. A brawl-like kind of football was played in England as early as the 10th

century, and by the 12th became a national problem. The game was making London a bedlam. Besides, it was diverting the yeomen from archery, the sport that fitted them to defend England. Hence football was banned by municipal laws and royal edicts. It was not fully reinstated until the 17th century, when Charles II opened his country to many diversions theretofore prohibited. The sport began to take definite form at boys' schools. Some even drew up rules. These allowed the ball to be kicked, but not carried, toward the goal.

The Father of Our College Game

One November afternoon in the year 1823, something strange happened at Rugby, a famous boys' school. The score was tied in a football battle between two class teams. Dusk was settling. Suddenly a player named Ellis "with a fine disregard for the rules of football as played in his time took the ball in his arms and ran with it" across the goal line. The score was not allowed. But the event made history and began Rugby football, from which the American game is directly descended. A tablet at Rugby commemorates Ellis' exploit.

By 1863 Rugby had become so popular that those who clung to the idea that football should be played with the feet and not with the hands met in London and formed the Football Association. Thereafter this game was known as "Association football," or "soccer," a jumbled abbreviation of the word association.

Football came to America probably with the English colonists who established Jamestown in 1607. An inflated pig bladder commonly served as the ball for early American games. Women played, too, because throwing and passing were more important than kicking.

Late in the 18th century, football of the most primitive type elbowed its way to a prominent place among college diversions. Early in the 19th century, football games were played at Harvard and Yale to determine class supremacy between freshmen and sophomores. The "games" were hardly more than mass rushes and "slug fests." In 1860 authorities at Harvard and Yale ended these brawls, and Harvard students held a mock funeral for "Football Fightum."

An important step toward making football a recognized sport was the organization of the Oneida Football Club of Boston in 1862. The founder of this "first organized football club in the United States" was Gerrit Smith Miller.

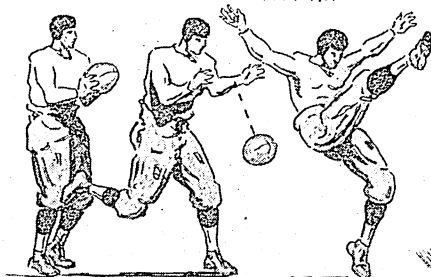
The First Football Game Between Colleges

The first intercollegiate football game grew out of rivalry between Princeton and Rutgers. For years they had been rivals for the possession of a Revolu-

MORE LESSONS IN FOOTBALL—KICKING AND PASSING THE OVAL

THE PUNT

STAND WITH FEET TOGETHER—
CATCH BALL WAIST HIGH—LEG
SWINGS FREELY FROM HIP

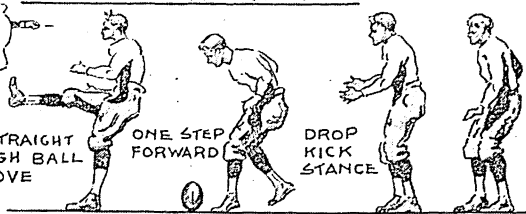


THE PLACE OR DROP KICK

KICK STRAIGHT
THROUGH BALL
AS ABOVE

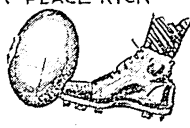
ONE STEP
FORWARD

DROP
KICK
STANCE



CONTACT
FOR PUNT

CONTACT FOR DROP
OR PLACE KICK



CENTER'S
GRIP

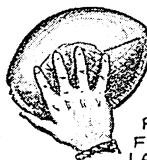
FOR SPIRAL
PASS TO
PUNTER

FOR END-
OVER-END
PASS TO
DROP
KICKER

THE FORWARD PASS

THE LATERAL PASS

IT'S TOSSED WITH BOTH
HANDS TO A TEAMMATE,
WHEN TACKLED



FORWARD
PASS GRIP—
FINGERS ON
LACES

THROWN WITH HIGH ARM
SWING—CAUGHT BY
LEAPING HIGH WHEN AT
FULL SPEED

As our pictures show, the punt is made with the instep, the place or drop kick with the toe. The various methods of gripping the ball for different passes also are illustrated, as is the thrilling leaping catch which completes many a forward pass.

tionary War cannon. In 1869 it was suggested that they play a football match of three games to determine which was the better school. So, on Nov. 6, 1869, at Brunswick, N. J., football teams from two colleges clashed for the first time. Rutgers won, 6 goals to 4. The game was played with 25 men on a side. A few days later, Princeton won at its home field, 8 goals to 0. To prevent violence, school authorities forbade a third and deciding game.

The first American intercollegiate games were governed more or less by Association (soccer) rules. Running with the ball (advancing it by carrying) was generally prohibited. The first match between Rutgers and Princeton showed that there was a lack of uniformity in rules. After the formation of teams at Columbia in 1870 and at Yale in 1872, the four schools held a conference at New York City in 1873 and agreed upon some general regulations.

Influence from Canada

Harvard laid the foundation for modern intercollegiate football by bringing some of the principles of Rugby into the American game. This happened in 1874, when the McGill University Football Club of Canada came to Cambridge, Mass., at the invitation of Harvard. Two games were played, the first under Harvard rules, and the second under the Rugby rules of McGill. Rugby impressed Harvard players so favorably that they decided to abandon what was called the "somewhat sleepy type of game now played by our

men." Yale, Princeton, and Columbia soon followed suit by injecting Rugby into their rules, and by 1876 the right to run with the ball was generally recognized.

Five Builders of Modern Football

The development of modern football is the work of many capable men. Five who helped the game especially were Walter Camp (1859–1925) and the coaches Amos Alonzo Stagg (born 1862), Fielding H. Yost (born 1871), Glenn S. Warner (born 1871), and Knute Rockne (1888–1931).

Walter Camp is called "the father of American football," because he is credited with doing more than any other man to bring the intercollegiate game to its present status. A star at Yale for several years, he gained a deep insight into the problems of football. While still at school he was made a member of a rules committee in 1878, and from then until his death he served as an adviser of every important group that had to do with intercollegiate rules.

In 1880 he induced the rule makers to change the game in three respects. First, the number of players on a team was reduced from 15 to 11. Second, "scrum" or scrummage was replaced by scrimmage. In scrum, the ball was put into play merely by placing it on the ground between the lines of the opponents and letting the players scramble for the ball. The team which had held the ball on the last play was thus never assured of its possession on the next. Scrimmage, on the other hand, gave the holder of the ball the right to put it

into play either by kicking it or snapping it back with his foot. The third important change in 1880 was the creation of the position of quarterback. He was defined in the new scrimmage rules as "the man who first receives the ball from the snapback."

Scrimmage created a difficulty, for a team once in possession of the ball might play in such a way as to hold it forever. Hence, in 1882 Camp introduced a rule that a team failing to advance the ball at least 5 yards in three plays, or downs, must surrender it to the opponents. This is the basis of the present rule that a team must advance the ball at least 10 yards in four downs. In 1888 Camp put through the rule which permits tackling below the waist.

How the Game Was Saved

Perhaps the outstanding contribution of Camp to football was his cooperation with others to save the game from brutality. Mass plays, such as the V-shaped or wedge formation, were causing injuries and deaths. Often a player would be tossed bodily across the scrimmage line with the ball in his hands. At other times a team would lock hands around the man carrying the ball and sweep everything before it. Tough characters called "ringers" were hired as players by some colleges. These tactics disgusted many schools. West Point and Annapolis abandoned the game. President Theodore Roosevelt even called football experts to a White House conference in 1905 to see what could be done to prevent death and injury. In 1906 the rule makers revolutionized the game by introducing the forward pass, which led to a more open style of play. In 1910 mass plays were banished forever by abolishing interlocking interference and requiring seven men on the line of scrimmage.

No man did more than Walter Camp to publicize football. For example, he drew national attention to the game when in 1889 he started his practice of choosing an "All-America Team" at the close of each season. This honorary "eleven" included what Camp considered the nation's best college and university players. Hundreds of all-American teams are now chosen each year by press associations and sports writers.

The Work of Stagg and Yost

Another Yale graduate who raised the standards of the game was Amos Alonzo Stagg, athletic director and football coach at the University of Chicago from 1892 to 1933. In 1896 he helped to organize the Western Intercollegiate Conference, now the Big Ten, which pioneered with eligibility rules. These require that

players be reasonably proficient in their studies. He developed many stars, including Clarence Bert Herschberger, Walter Steffen, and Walter Eckersall. Stagg won fame, not only for his coaching prowess, but also for the fine example he set his men in clean living. During his later years at Chicago, he was called "the Grand Old Man."

A builder of mighty teams was Fielding H. ("Hurricane") Yost, football coach at the University of Michigan for more than 25 years.

PERFECT EXAMPLE OF A LATERAL PASS



Player No. 44 was running with the ball when a tackler stopped him. We see him just as he is going down passing the ball to his teammate at the extreme left, who will continue the run.

When Yost entered upon his job in 1901, the game was already well established at Michigan. Indeed, this school was probably the cradle of college football in the West. As early as 1873, Michigan had challenged Cornell, and arrangements were made to play at Cleveland, 30 men on a side. But the proposed game never took place, for Andrew Dickson White, then president of Cornell, decided: "I will not permit 30 men to travel 400 miles merely to agitate a bag of wind." Not until 1879 did Michigan play its first intercollegiate football game, defeating Racine College in a battle at White Stocking Park, Chicago. It was Yost who raised Michigan to power in the football world. His team of 1901, built around a freshman, Willie Heston, scored nearly a point each minute of play; it amassed 550 points in 11 games and kept its opponents from scoring even a single touchdown. Yost continued to develop "point-a-minute" teams during the next few years. After 1921 he served Michigan as director of intercollegiate athletics and gave much time also to developing a model program of intramural sports.

A Master Mind of the Gridiron

More spectacular than either Stagg or Yost was Glenn S. ("Pop") Warner, the coach who took over the football team at the Carlisle Indian School in 1899. A graduate of Cornell, Warner first went to Georgia and then back to his alma mater, from where he was ap-

pointed to Carlisle. There he introduced the line shift and experimented with the forward pass to develop what is called the Warner system of play, now taught by many coaches. There, too, he developed fine teams, notably those built around Jim Thorpe, whose speed and power made him an all-America star.

Rockne, Builder of National Champions

In all the history of football, there has never been a greater teacher and leader than Knute Rockne, head coach at Notre Dame University from 1918 until his death in an airplane accident in 1931. While a student at Notre Dame, Rockne played on the team that went east in 1913 and overwhelmed West Point (Army) by throwing forward passes from all angles of the field. The next week Army imitated Notre Dame tactics and trounced Navy. As coach at Notre Dame, Rockne developed the forward pass and the line shift to such a degree of perfection that many other coaches adopted

his style of play and called it the "Rockne system." His leadership inspired his teams to beat many of the strongest elevens in the nation and to gain in some seasons the honorary title, "national champion." His teams won every game in the seasons 1919, 1920, 1924, 1929, and 1930. The eleven of 1924 traveled 10,500 miles and played in seven states. It climaxed the season by defeating "Pop" Warner's powerful Stanford team, 27 to 10, at the Rose Bowl classic of New Year's Day, 1925. The success of the 1924 team was due largely to the brilliant play of the backfield, known over the nation as the "Four Horsemen." They were Harry Stuhldreher, James H. ("Jim") Crowley, Elmer Layden, and Donald ("Don") Miller. All became coaches after graduation from Notre Dame.

Other Famous Coaches

Among the names of football "greats" must be included that of Dr. Harry L. Williams, a graduate of Yale. While coach at the University of Minnesota in 1909, he introduced the Minnesota shift, a stratagem that calls for several line plays intended to draw in the backfield and then for a surprise forward pass over the concentrated line. Another master of strategy is Robert C. ("Bob") Zuppke. Too small to win a place

on the varsity in his student days at the University of Wisconsin, he later became coach at the University of Illinois and there built some of the nation's best teams. His masterpiece of strategy was the running attack which he built around his halfback, Harold E. ("Red") Grange, in the years 1923-25. Aided by his teammates' powerful and well-timed interference, the fleet Grange broke loose time after time and scored as many as five touchdowns a game.

A new type of offense, called "razzle-dazzle" because it aims to bewilder the defense, has become popular largely because of its successful use by the coaches Ray Morrison and Andrew ("Andy") Kerr. Morrison pioneered with razzle-dazzle while coach at Southern Methodist University, and Kerr brought it to perfection at Colgate. Razzle-dazzle employs lateral as well as forward passes with bewildering speed, and one play may involve not one but half a dozen or more passes back and forth between two or more men.

Professional Game

Professional ("pro") football, so called because its players receive pay, originated in the Eastern states about 1895. It spread west to Ohio in 1902 and 1903, and soon took hold as far west as the Mississippi River. With the formation of the National Football League in 1921, professional football took a place among the major sports of the nation.

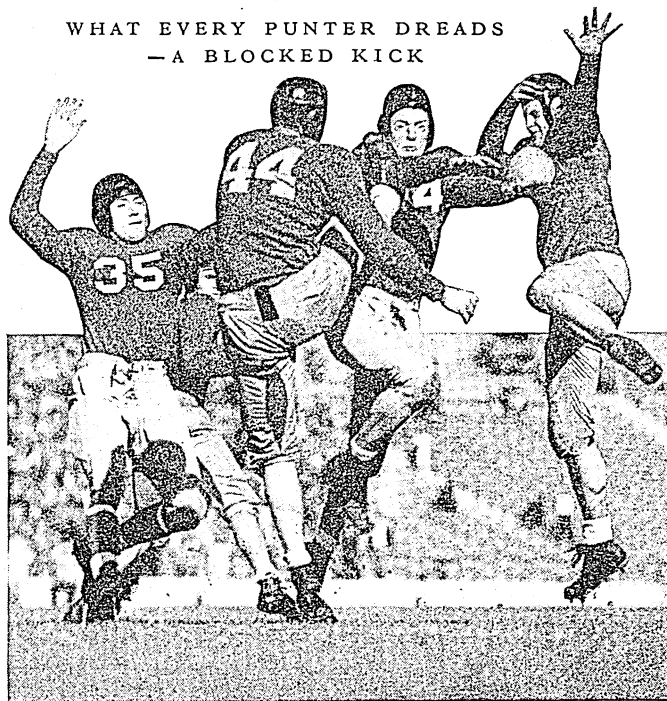
Professional football employs ex-college stars, for their fame spurs ticket sales. Crowds at Sunday "pro" games compare in size with

thronges that fill stadiums for Saturday college games. To find out how the best professionals compare with the best college players, the *Chicago Tribune* inaugurated an annual all-star game in 1934. This battle at Soldier Field, Chicago, is waged between the champion professional team and an all-star collegiate team, the latter chosen by a nationwide vote of newspaper readers. Similar games are played in other big cities.

"Six-Man" and "Touch" Football

A game called "six-man football," invented by Stephen Epler and first played at Hebron, Neb., in the fall of 1934, has become widely popular. It differs from intercollegiate football in that: (1) six men—a center,

WHAT EVERY PUNTER DREAMS
—A BLOCKED KICK



Just as the ball left the foot of the kicker (with back to the camera), two opponents, who had broken through the line, jumped up and stopped it. This is close and dangerous work, but it often turns the tide of a whole game.

two ends, and three backs—constitute a team; (2) the playing field is 80 by 40 yards; (3) quarters are only 10 minutes long; (4) a field goal counts 4 points; and (5) the player receiving the ball from center may not cross the scrimmage line with it, but must pass it to a teammate.

A popular playground sport is touch football, so called because *touching* or tagging is substituted for tackling. Any number may play, though a team ordinarily has from 7 to 12 members. The team in possession of the ball is allowed four downs in which to advance it 20 yards. A game is commonly divided into two 12-minute periods with a 4-minute intermission.

Association Football (Soccer)

Association football (soccer) still holds to the pre-Rugby style of game and uses a round ball. The ball, after being put in play, may not be carried or touched by the hands or arms, except by the goalkeeper. It is advanced chiefly by kicking and dribbling it with the feet. A goal is scored when the ball is kicked *underneath* the crossbar of the goal posts, which are 8 yards apart and 8 feet high. Eleven men play on a side, and the field is from 100 to 120 yards long and from 55 to 75 yards wide. Soccer is played by many schools in America and Europe. It has perhaps even greater popularity among non-school teams, such as those affiliated with the United States Football Association, incorporated in 1913. This organization also sponsors international soccer matches which are among the most brilliant of sports events.

Rugby, Reigning Game in the British Isles

Rugby, the parent of intercollegiate football, is little played in the United States. In the British Isles, however, it is so important that disputes over rules are taken before an international board composed of representatives from the Rugby Unions of England, Scotland, Wales, and Ireland. Rugby resembles the American game in that the ball is oval and may be advanced by carrying, passing, and kicking. But it differs notably in having 15 men to a team and in placing a higher premium on field goals.

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National Collegiate Athletic Association. *The Official NCAA Football Guide* (A. S. Barnes & Co., New York). Official rules.
Rockne, Knute K. *Coaching, the Way of the Winner* (Devin-Adair).
Stevens, Mal and Shorten, Harry. *How to Watch a Football Game* (Leisure League of America).
Zuppke, R. C. *Football Technique and Tactics* (Bailey and Himes).

FORD, HENRY (born 1863). In 1893, a "horseless buggy" chugged through Detroit. Crowds gathered whenever it appeared. Terrified horses ran away at its approach. The police sought to curb this nuisance by forcing its driver, Henry Ford, to secure a license. That car was the first of many millions produced by the genius who was destined in later years to make more automobiles than any other man in the world.

Henry Ford was born July 30, 1863, on a farm near Dearborn, Mich. His mother died when he was 12. He helped on the farm in summer, and in winter attended a one-room school. Watches and clocks fascinated the boy, and he went about the countryside doing repair work without pay, merely for the chance to tinker with mechanics. Years later Ford remarked: "My toys were all tools; they still are."

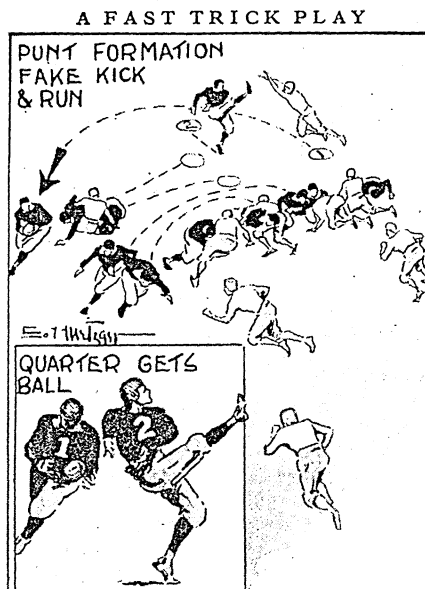
At 16, Ford walked to Detroit and apprenticed himself to a mechanic for \$2.50 a week. His board was \$3.50, so he worked four hours every night for a watchmaker for \$2 a week. Later he worked in an engine shop, and set up steam engines used on farms. In 1884 he took charge of a 40-acre farm his father gave him, married, and seemed "settled down." But after two years of farming he went back to Detroit and worked as night

engineer for the Detroit Edison Company.

Gasoline engines were just becoming popular, and they fascinated the man as watches had fascinated the boy. Ford built his first car in a little shed behind his home. Its two-cylinder engine over the rear axle developed four horse-power; a single seat fitted in a boxlike body; the car had an electric bell for a horn, and a steering lever instead of the wheel of today's automobiles.

In 1899, Ford helped organize the Detroit Automobile Company, which built cars only to order. Ford wanted to build them in great quantities, at a price within the reach of many, as Ingersoll had done with watches. His partners objected, and Ford finally withdrew from the organization.

In 1903, he organized his own Ford Motor Company. The authorized capital was \$100,000, but only \$28,000 was raised in cash. The cash came from 11 other stockholders, some of them neighbors whom Ford had kept awake by the sputtering motors of his first cars as he worked far into the night. One investor, who put \$2,500 into Ford's venture (only \$1,000 of it in cash), drew more than \$5,000,000 in dividends, and received more than \$30,000,000 when he sold his holdings to Ford in 1919. The company's assets, now



Here player No. 2, the full-back, has pretended to punt, but instead he tossed the ball under his arm to No. 1, the quarter-back, who circled back of him. No. 1 now dashes around right end, protected by two half-backs and two guards. This play has many variations.

held entirely by Ford and his only son, Edsel, have been estimated at three-quarters of a billion dollars.

The early automobile manufacturers merely bought parts and assembled cars. Ford aimed to make every part that went into his cars. He acquired iron and coal mines, forests, mills, and factories to produce and shape his steel and alloys, his fuel, wood, glass, and leather. He built up railroad and steamship lines, and an airplane freight service, in order to transport his products.

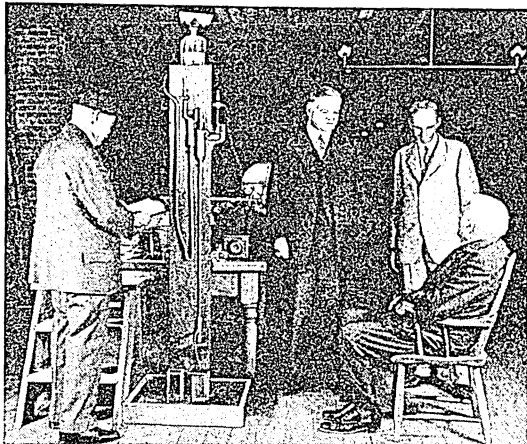
Mass production was Ford's main idea, and he replaced men with machines wherever possible. Each man was given only one task, which he did over and over until it became automatic. Conveyors brought the job to the man, instead of having the workman waste time going to the job. To cut shipping costs, parts instead of cars were shipped from the main plants at Detroit and River Rouge, Mich., and the parts assembled into cars at branches in the United States, Canada, and in other countries.

With all his business sagacity and inventive genius, Ford has always been something of a dreamer and an idealist. He established an eight-hour day, a minimum wage of \$5 daily (later raised to \$6), and a five-day week. He built a \$7,500,000 hospital in Detroit, with all rooms alike, fixed rates for services, and doctors and nurses on salary, with no financial relations with the patients. He established a school in which boys earn good wages while learning a trade. He created the historical village of Greenfield, Mich., a museum of American relics, where Independence Hall and other famous old buildings are reproduced. The laboratory in which Thomas A. Edison invented his electric light was brought there and rebuilt brick by brick. During the first World War, Ford chartered a "peace ship" and went to Norway with a party hoping to incite the neutral nations of Europe to end the war, but the venture failed utterly.

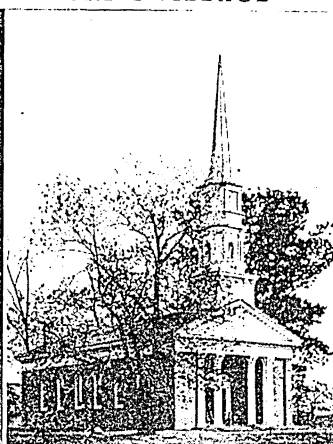
His genius for production reached its climax in the second World War as huge bombers, guns, and motorized equipment rolled out like a mighty tide from his factories at Willow Run, Detroit, and River Rouge.

FOREIGN EXCHANGE. In financial transactions between individuals of various countries, actual gold is transferred only in comparatively rare cases. Payment of indebtedness is usually made in the currency

AT THE "BIRTHPLACE OF LIGHT" IN FORD'S VILLAGE



At the left, President Hoover, Henry Ford, and Thomas Edison (seated), are shown as they appeared in Ford's reconstruction of Edison's laboratory, in Greenfield, Mich., at the 1929 celebration of the invention of electric light. At the right is a reconstructed church in Greenfield.



of the creditor's country with *bills of exchange* (see Credit). For example, suppose Chase, an American, has sold \$1,000 worth of goods to Smith, an Englishman, while Blake, another American, has bought the same amount from Jones, another Englishman. Instead of each debtor sending money across the ocean, Blake buys Chase's claim upon Smith, paying in American money. Chase then sends the claim to Jones, and Jones collects from Smith in English money.

Actually, such transactions are conducted through banks and dealers in "foreign bills" and exchange. Before the first World War, the charges for this service were based in part upon the *balance of trade* at the moment (see International Trade). If Frenchmen, for example, owed Americans more than Americans owed Frenchmen, the French paid more for bills collectible in American money, until the price became equal to the cost of shipping

gold. Then exchange was said to be at the "gold point," and France shipped gold until the flow of exchange each way became equal.

During and after the first World War, most nations feared that uncontrolled transactions in foreign exchange would drain away their gold and make their money valueless (see Money). To prevent this, they adopted various restraining measures. Most governments forbade export of gold except by special permission. Some even forbade private money payments in foreign trade, and substituted government *barter* of goods. Many of them used a *stabilization fund* to buy or sell exchange as needed to maintain a "pegged" or fixed relation between their money and that of some major power, such as Great Britain. The second World War, beginning in 1939, brought universal control of foreign exchange transactions.

HENRY FORD



Genius of Motordom

The LIFE-GIVING WOODLANDS and Their FOES

IN MANY regions which are now arid and barren, dense forests once covered the mountain slopes and valleys. Beautiful streams rising in the mountains were fed by the waters that slowly seeped from the forest floor and flowed through the land, keeping the soil moist and fertile. But men came and stripped the hills of their forest covering. Now when the rains fall the streams often become swollen and carry off the water in torrents, flooding the valleys and covering them with sand and gravel. The hot sun quickly draws the moisture from the ground, and the springs and the streamlets dry up, leaving empty beds. Successive drouths soon kill vegetation, and in a few years once fertile areas become barren waste lands. This article tells you something about the beneficent gifts of Nature and the efforts being made to protect them.

FORESTS AND FOREST PROTECTION. Next to the earth itself the forest is man's most useful servant. Without the aid of the forest he could have made little progress in civilization. Forests protect the headwaters of rivers and help prevent floods. The roots of trees hold back soil which might be washed away to clog river beds and cause the streams to overflow. The carpet of humus, underneath the trees, like a thick piece of blotting paper, soaks up heavy rains and melting snows.

The forests provide healthful air by filtering out dust. Forest

fogs save near-by fields from early frosts, and from damage by hail. And finally, forests provide many useful products, and serve as the home of wild animal life and as a place for man's outdoor recreation. Indeed, the very word forest comes from the Latin word (*foris*) which means "out of doors."

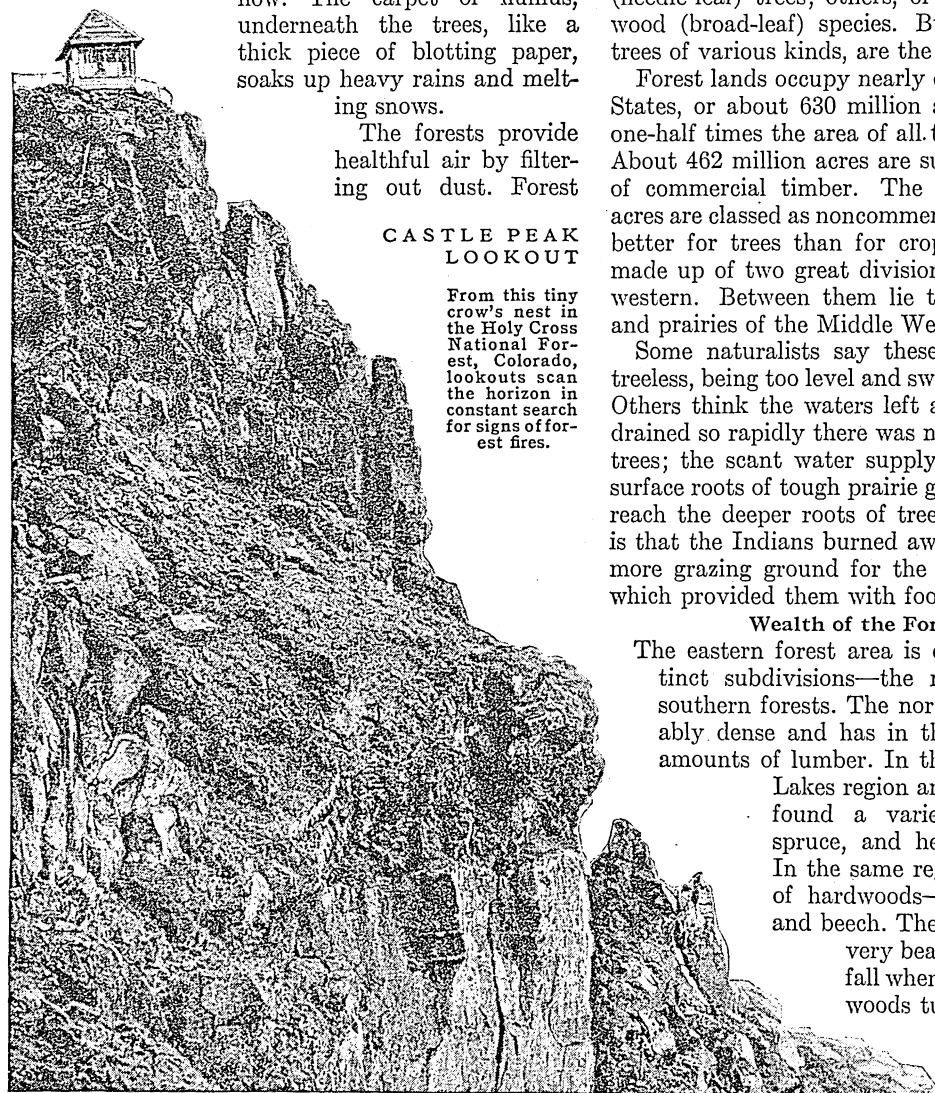
Some forests consist of "conifers," or evergreen (needle-leaf) trees; others, of "deciduous," or hardwood (broad-leaf) species. But mixed forests, with trees of various kinds, are the commonest.

Forest lands occupy nearly one-third of the United States, or about 630 million acres. This is one and one-half times the area of all the nation's crop lands. About 462 million acres are suited to the production of commercial timber. The remaining 168 million acres are classed as noncommercial, but are considered better for trees than for crops. The forest area is made up of two great divisions, the eastern and the western. Between them lie the vast treeless plains and prairies of the Middle West.

Some naturalists say these prairies were always treeless, being too level and swampy for trees to grow. Others think the waters left after the glacial period drained so rapidly there was not enough moisture for trees; the scant water supply was absorbed by the surface roots of tough prairie grasses before any could reach the deeper roots of trees. Still another theory is that the Indians burned away the forests to make more grazing ground for the bison and other game which provided them with food.

Wealth of the Forest Lands

The eastern forest area is divided into three distinct subdivisions—the northern, central, and southern forests. The northern forest is remarkably dense and has in the past furnished vast amounts of lumber. In the forests of the Great Lakes region and in New England are found a variety of conifers—pine, spruce, and hemlock predominating. In the same regions are found forests of hardwoods—mostly maple, birch, and beech. These northern forests are very beautiful, especially in the fall when the leaves of the hardwoods turn to brilliant hues of yellow, red, and brown, in strong contrast with the



**CASTLE PEAK
LOOKOUT**

From this tiny crow's nest in the Holy Cross National Forest, Colorado, lookouts scan the horizon in constant search for signs of forest fires.

dark foliaged conifers. This same type of forest is also found in Canada. In the central woodlands there is a marked absence of conifers, but the same hardwoods are found there as in the northern forests, together with oaks, sycamores, chestnuts, ashes, and hickories. The southern forests have conifers and hardwoods, but the species of both these groups differ from the northern ones. The yellow pines, the bald cypress, and the white cedar are among the characteristic conifers, while oaks and gums are the prevalent hardwoods. The forests here are less dense than the northern, having been frequently burned over in many regions.

The western forests are marked for their beauty and the gigantic proportions of much of the timber. Sequoias, redwoods, firs, pines, and spruces are among the giant conifers found on the Pacific coast. The magnificent sequoias of California are truly the "big trees" of nature's finest forests,

some specimens having a height of 350 feet and a diameter of 30 feet on the ground (*see Sequoia*).

The forests of Europe do not differ greatly from those of the eastern United States. Oaks and beeches abound in England, France, and Germany, while pines, firs, and other conifers grow in the north and on the mountains.

The Life Struggle in the Forest

The life of a forest is an endless struggle. Each tree must fight continually for its right to live, for on every side are other trees crowding and groping outward and upward for the light and air which, together with soil nourishment and moisture, are necessary for their growth. Tall trees are continually sending out new branches in search of light, the lower branches dying as the heavy foliage above shuts out the sunlight. This accounts for the bareness of the trunks of forest trees in dense stands since the dead limbs have been shed in the process of growth. The evergreens, with their conical tops, naturally grow closely together. The hardwoods in the forests grow farther apart, for their broad tops require more room to spread.

Of all the foes that attack the woodlands, forest fires are the worst. Man's carelessness causes more

than nine-tenths of the fires which sweep millions of acres every year and destroy timber worth tens of millions of dollars. Carelessly dropped matches, fires built to make clearings, or neglected camp fires, often start conflagrations in the forest. Lightning also starts many fires. Live stock owners seeking to extend their pasturage, and berry pickers trying to insure a better crop in later years, have started many incendiary

blazes. The national forests alone in recent years have suffered more than 7,000 fires a year (1925-29 average). These burned nearly 480,000 acres and caused a damage of more than \$2,000,000 a year in timber values alone, not taking into account losses of young growth, watershed values, wildlife, etc.

Careless felling of timber kills many fine young trees, and often the young growth is ruthlessly slashed away so that the logs may be moved more readily. This waste is being checked somewhat by se-

lective lumbering, that is, the trees desired for timber are marked by experts, and only the marked trees are felled. The trees are selected so that felling them will not disturb the young growth.

Grazing and Insect Damage

Grazing costs heavily when the woods are burned to make new pasture. Also the animals trample delicate rootlets, browse on leaves and twigs, and eventually kill not only seedlings but also injure vigorous trees. Insect foes work appalling damage, and millions of dollars are spent fighting them. Some eat leaves, others bore into trunks, some kill the shoots at the top, others attack the roots. Spraying or dusting with poisons and the removal of infested bark may kill certain pests. Parasitic enemies of forest insects also may sometimes serve as a check. Sometimes, however, it is necessary to cut down all infested trees, and even other-trees in the vicinity to control an infestation.

The destroying insect is usually associated in name with the tree upon which it preys. Thus, the southern pine-beetle infests the yellow pine of the South; the eastern spruce-beetle attacks spruce; the mountain pine-beetle and western pine-beetle attack the pines

FIGHTING THE INSECT ENEMIES OF TREES



This view of a stretch of ruined forest shows the damage insects do to standing timber when they get a chance. The picture was taken in South Dakota, and shows the results of the ravages of the pine bark beetle some years before. The trees were killed by the insects and are now rotted and broken.

HOW A FOREST FIRE LOOKS FROM AN AIRPLANE



Aerial view of a burning forest near Santa Barbara, Calif. The airplane has won for itself an important place in the Forest Service fire-fighting system, and is useful not only in spotting incipient blazes, but in patrolling areas obscured by smoke.

of the Rocky Mountain regions; the Douglas fir-beetle damages the Douglas fir. Besides the numerous bark-beetles, there is a second army of pests made up of borers and weevils. A third army of parasites consists largely of caterpillars, lice, scales, gall-makers, leaf-miners, and sawflies.

Fungi and parasitic growths also kill many trees, especially trees already weakened by pests. Chestnut blight, a fungous disease, has killed practically all the native chestnuts in the northeastern United States. Blister rust is a dangerous enemy of white pine.

The Penalty of Forest Destruction

The Sahara was not always a desert. Early Egyptian records allude to the herds of buffalo that roamed a forested region now the center of the Sahara. The remains of trees growing along vanished rivers and dried-up lakes are still in evidence. When the Arabs settled in that part of Africa, they cleared the forests, raised some crops, pastured vast herds of goats, and moved on incessantly. Ruined forests were left in their wake, and shifting sands completed the wreckage.

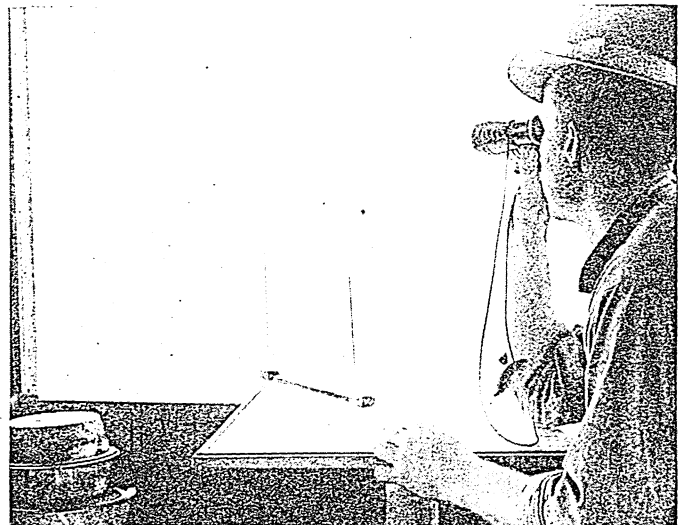
China once had a rich forest covering, but the trees were cut down with a prodigal hand. Fires destroyed the remaining vegetation. Then the heavy rains which swept over the land washed away the fertile top-soil, no longer held in place by forest covering, washed it into streams and out into the ocean. Millions of acres of barren waste, where nothing grows, replaced the priceless forests and the fruitful soil. Is it any wonder that China, year after year, is harassed by famine and flood?

Much of the present forest area of the United States has been culled, cut over, or burned. Of the 462 million acres of commercial forest land, 73 million have been exploited until now they produce almost nothing for industry. About 174 million acres have

been stripped of all trees of sawmill size, but still furnish pulpwood and other products. The remaining 215 million acres still contain more than 1,000 billion board feet of sawmill timber. Only a small fraction remains of the estimated 820 million acres of virgin timber originally in the United States.

This country is at present using or destroying its forests more rapidly than they are being replenished;

A LOOKOUT ON HIS LONELY VIGIL



At the sight of smoke, the lookout finds its exact direction with the alidade and plane-table that stand in front of him. Another lookout, miles away, sights the fire from another angle. The two results sent by signal or phone to a central station fix the fire's exact location.

still, only Russia, the British Empire, and Brazil have more timber-land than the United States.

Forest Conservation

Long ago men began to recognize the vast national importance of the forests, and steps were taken to prevent their ruthless destruction and to promote reforestation. Throughout Europe, especially in Germany, forestry or forest protection and cultivation

ONLY ONE JUMP AHEAD OF THE FIRE FIEND



To prevent the spread of forest fires, rangers lay bare a strip in the path of the flames, cutting away the brush and debris. While not the most enjoyable job in the world—it is, in fact, one of the meanest—it is not without its thrills. The tourist, neglecting to put out his camp fire, may cause one of these blazes, in the fighting of which men risk their lives.

has been reduced to a science, and has for some time been an economic factor of great importance (see Black Forest). In the United States the supply of timber once was apparently so inexhaustible that almost nothing was done to prevent wasteful lumbering until 1891, when Congress empowered the president to create forest reserves, now called national forests. President Harrison then established the Yellowstone Park Timberland Reserve. This was the first of the national forests, which now cover some 175 million acres.

In 1911 the Weeks law provided for acquiring forest lands on the watersheds of navigable streams. Under this law, land could be purchased, and gifts of land could be accepted. As a result, tracts were acquired in the Appalachian and the White mountains. The Clarke-McNary act of 1924 provided for federal cooperation with state governments and private land owners in fire protection and the distribution of trees for planting on the 150 million acres of forest lands owned by farmers. The McSweeney-McNary law of 1928 expanded forest research activities, and the McNary-Woodruff law enlarged the purposes for which national forests could be

created. By the Taylor act of 1934 livestock grazing privileges are limited to consumption of the annual growth of grass. Lumbering is permitted under regulations which insure the maintenance of a full stand of growing timber.

Recent Forest Work

The Civilian Conservation Corps, created in 1933 as a relief project, did much useful forestry work. A large proportion of its some 300,000 members were in forest projects. They planted trees on public and private land, built roads and firebreaks, set up fire towers, and fought forest fires.

Another project, begun in 1935, was a national shelterbelt, a system of windbreaks to reduce wind erosion and to conserve soil moisture on the Great Plains. A strip of forest, 100 miles wide, was to be planted from Texas to North Dakota. This plan soon gave way to the Prairie States Forestry project, whereby farmers cooperate with the Forest Service in planting field shelterbelts on their own land. A belt usually has ten rows of trees, one-half to a mile long, at right angles to prevailing (usually north-south) winds.

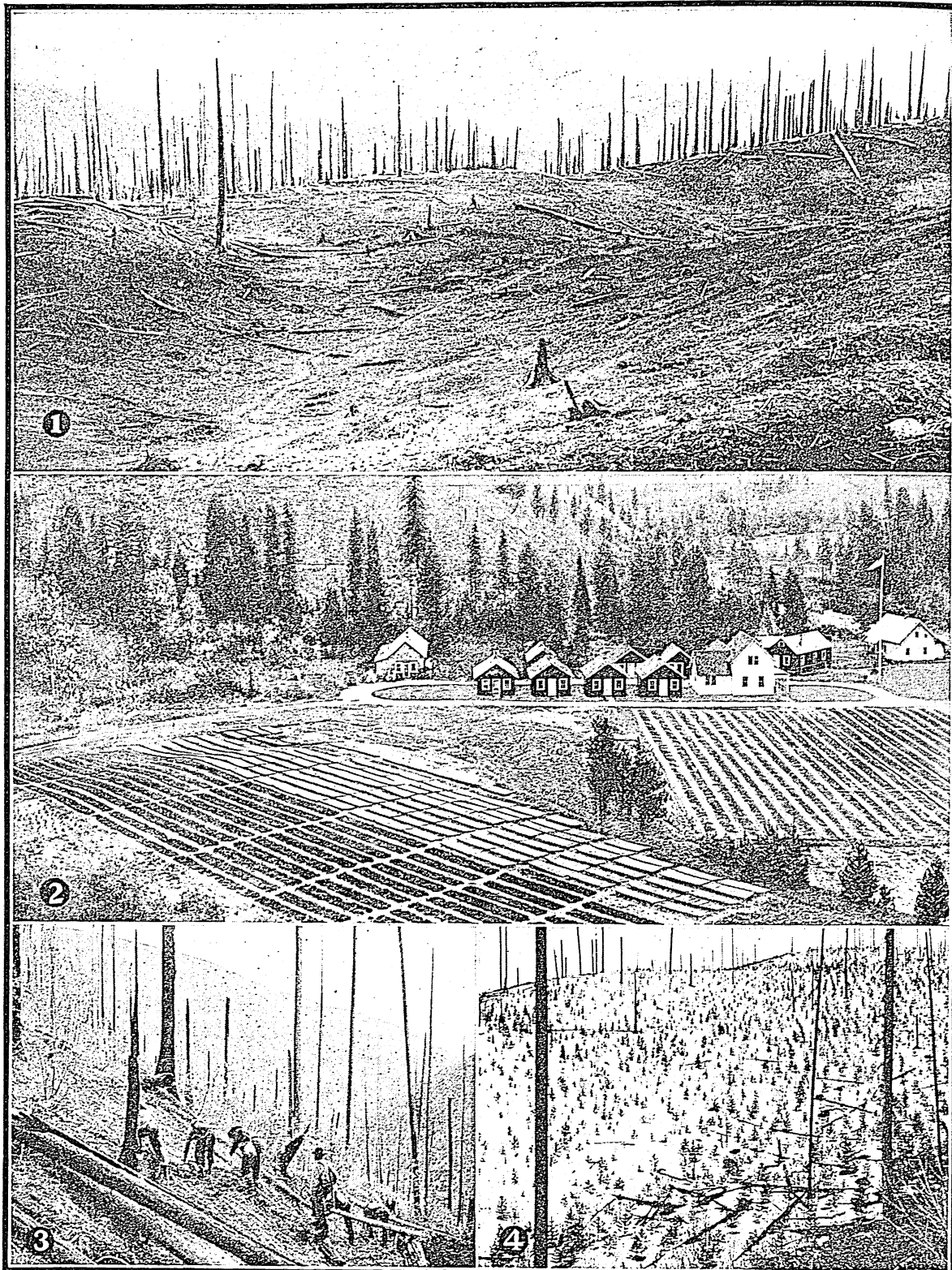
As part of a program to retire submarginal farm land, millions of acres of stumpage land and

DOOMING A FOREST MONARCH



The woodman will spare other trees, but not this, as trees to be cut for sale in our national forests are marked in advance by the ranger. Enough of the younger and seed-bearing trees will be left to insure a later crop.

HOW NEW FORESTS REPLACE THE OLD



These pictures show one great phase of the work of the Forest Service of the United States, that of restoring trees to areas that have been deforested. 1. Barren and devastated in the wake of fire, this burned-over area on Mount Hebo, Siuslaw National Forest, Oregon, would seem almost beyond redemption, but it has since been replanted to nursery-raised Douglas fir. 2. Monument nursery, Pike National Forest, Colorado, where thousands of seedlings for reforestation are grown. 3. Planting crew setting out seedlings in a denuded section of the St. Joe National Forest, Idaho. 4. Plantation of yellow pine, 11 years old, in Lolo National Forest, Mont.

other poor land in farms have been bought by the government, to be added to state, county, or national forests. (See also Conservation.)

The Watchful Guardians of the Forest

If you should visit one of the national forests, you would be sure to meet one or more forest rangers. These are trained men employed by the government to guard and protect the forest. From a lookout station on the peak of a commanding hill, you would perhaps see a man intently scanning the surrounding woods through field glasses. Should he see the telltale smoke of a forest fire eating its way through the timber, he immediately gives the alarm by telephone to ranger headquarters. Aid is rushed to the threatened point and with shovels to scatter dirt and dig trench lines, axes to clear a gap and remove brush, and perhaps with pumps to supply a stream of water, the fire is prevented from spreading. This system has been very effective, especially in the west, and most fires are extinguished without great loss. A shift in the wind, however, often works great havoc, for the fire breaks out in other directions and sometimes many miles of forests and even villages are destroyed.

Grazing is permitted on rangelands within some forests but is so regulated that the forage crop will not be depleted nor watershed protection valves destroyed. Men educated in the science of forestry also cultivate young trees, and use these to replant areas which have been burned over to such an extent that natural reproduction has been hampered.

Forest Rangers "on Wings"

The airplane has become a valuable aid in the protection of the national forests, for with an airplane a forest officer can reconnoiter large fires or detect new outbreaks of fire at times when visibility from ground lookouts is poor. It also has proved valuable in the rapid transportation of men and supplies to fires.

State laws supplement the national regulations for forest protection. Many states and counties have established public forests. Lumbermen are beginning to realize the value of keeping the forests productive, and are trying both to prevent waste and to save the young growth. Some states are replanting cut-over areas, as in Vermont, and in some, efforts are being made to revise the tax laws so that private owners who reforest portions of land will not be burdened during the period needed to mature a crop of trees.

The Forest Service of the United States is a branch of the Department of Agriculture. Its objects are to promote the conservation, protection, and development of the forest resources of the country. The Forest Service administers the national forests for the use and benefit of the people of the United States. In addition to protecting the forests from fire and depredation and supervising national forest grazing and lumbering privileges, the Service conducts investigations at experiment stations and coöperates with states and individuals in furnishing advice as to the best way of managing their forest holdings. Similar duties are performed in Canada by a Director of For-

estry, attached to the Department of the Interior.

In many states a *Forest Week* is set aside each year by proclamation as a means of educating people in forestry conditions. In 1920, a "forest protection week" was celebrated in the Pacific Northwest; the Federal government endorsed the move in 1921, and for several years an American Forest Week was observed nationwide. Nearly every state and many foreign countries observe an Arbor Day each year for the planting of trees.

A list of national and state forests will be found with the entry Forests in the Fact-Index.

FORGET-ME-NOT. Centuries before it grew in North America, this exquisite little blossom was cherished by the people of Europe and Asia as the emblem of true love and constancy. Of all the pretty legends that cluster about it, perhaps the happiest is this Persian folk-story, told by the poet Shiraz:

It was in the golden morning of the early world, when an angel sat weeping outside the closed gates of Paradise. He had fallen from his high estate through loving a daughter of earth, nor was he permitted to enter again until she whom he loved had planted the flowers of the forget-me-not in every corner of the world. He returned to earth and assisted her, and together they went hand in hand. When their task was ended, they entered Paradise together, for the fair woman, without tasting the bitterness of death, became immortal like the angel whose love her beauty had won when she sat by the river twining forget-me-nots in her hair.

Transplanted to America, the forget-me-not soon escaped from the gardens to adorn brookside, marsh, and low meadow. It grows from Nova Scotia to New Jersey and westward into Pennsylvania, where from May until August its clustered, pink-tinted buds unfold into the tiniest sky-blue blossoms with yellow eyes. The true forget-me-not, cherished the world over for love and remembrance, is this timid, moisture-loving baby-blue flower of the woods. Other attractive cultivated species are the dark blue forget-me-not of the Azores (*Myosotis azorica*), the early flowering *Myosotis dissitiflora*, and *Myosotis versicolor*.

Forget-me-nots belong to the borage family, *Boraginaceae*. The true or common forget-me-not is *Myosotis scorpioides*. Flowers flat and 5-lobed, sky blue with yellow eye, growing in long one-sided clusters, funnel-shaped corolla inclosing 5 stamens; calyx short and 5-cleft. Stems creeping, slender, hairy, 6 to 18 inches long. Leaves light green, oblong and lance shaped, somewhat shiny on top and hairy underneath, growing alternately on stem.

FORMALDEHYDE. This gas is much used as a disinfectant because it is deadly to bacteria and is easy to use. Formaldehyde is composed of carbon, hydrogen, and oxygen (CH_2O), which will dissolve in alcohol or in water. A 30 to 40 per cent solution in water which contains some wood (methyl) alcohol is called "formalin." If a little sulphuric acid is added to a solution of formaldehyde, a white powder is formed, called "para-formaldehyde" or "paraform," which has the same percentage of carbon, hydrogen, and oxygen as the original formaldehyde. Paraform is convenient to handle and so is the usual commercial form in which formaldehyde is obtained. For disinfecting rooms paraform is volatilized over a lamp, or

formalin is heated, and the formaldehyde rises in vapor. The odor is so pungent and irritating that weeks after a fumigation one's eyes will smart upon coming into the room. Formaldehyde will keep food from spoiling, but its use as a preservative is regarded as injurious and is prohibited by law in most states (see Antiseptics). It is also used extensively for the manufacture of artificial plastic materials like "bakelite" (see Coal-Tar Products).

FORMOSA. Sailing off the coast of China in the year 1590, some Portuguese traders sighted an island whose wondrous beauty struck them so forcibly that they cried out, "Ilha Formosa! Ilha Formosa!" (beautiful island). A few years later the word "Formosa" appeared on the charts of Dutch navigators and at last became the accepted name of this semi-tropical island. The Japanese, to whom Formosa was ceded by China in 1895, call it Taiwan.

The beauty of the island contrasts strangely with the savagery of the native inhabitants, who made the name Formosa terrible in the ears of sailors for many generations. For these muscular, broad-chested savages, with their huge hands and feet, large mouths, and broad flat noses, were cannibals and head-hunters; and until recently any unfortunate mariner cast away on the coast in the terrible storms that sweep the China Sea could expect no better fate than death.

But under the vigorous hand of the Japanese government these wild people have been driven into the mountain fastnesses, where they are hemmed in by high barbed-wire fences that can be electrically charged. The military patrols are moving these barriers up the mountain sides as fast as the hill people are subdued. Many of the reclaimed villages now have their schools and markets.

Most of the island is mountainous and heavily forested. Mount Morrison (Niitaka-Yama), with a height of about 13,000 feet, is the highest point in the Japanese Empire. In the west are lowlands, which produce bountiful crops. Here the mean annual temperature is about 70° F. and the rainfall averages between 60 and 80 inches. Winters are mild.

The island is rich in plant life. Wild flowers bloom the year round, many of them beautiful varieties of lilies, orchids, azaleas, rhododendrons, and flowers which are commonly known elsewhere only as hot-house plants. In the southern districts grow such tropical fruits as pomegranates, pineapples, figs, guava, bananas, and oranges.

Tiger cats, Tibetan bears, deer, civets, wild boars, apes, pangolins, and squirrels abound. In all parts are found venomous snakes. One of the most beautiful of the many birds is the blue magpie, with its

black head and neck, vermilion bill and legs, and blue and white body. The most important domestic animal is the water buffalo, which long ago was brought in from China as a beast of burden.

Farming is the chief occupation. The principal crops are rice, tea, sugar, sweet potatoes, bananas, and turmeric (a root used as a condiment and as a yellow dyestuff). In the mountains are forests of camphor trees which give Japan virtual control of the world's supply of natural camphor.

Gold, silver, copper, sulphur, and coal are mined in considerable quantities and in recent years petroleum has been produced.

The capital, Taihoku, and the chief port, Keelung, are in the northern part. They are connected by railways with the other chief cities, which are in the western lowlands. More than 90 per cent of the people are of Chinese blood. Only about 5 per cent are Japanese, and the native tribes are less than one per cent. On an area of 13,908 square miles, a little larger than that of Maryland, the island supports a total population of some 5,225,000.

FORT SUMTER. Like an electric shock flashed the news through the Northern states, on April 12, 1861, that the South had fired upon Fort Sumter, and that the long feared Civil War had begun.

The United States government had commenced the building of this fortification on a small island in the harbor of Charleston, S. C., in 1829 and had named it for the Revolutionary hero, Thomas Sumter (1734-1832). But the country was at peace, there was no hurry, and the fort was still unfinished when South Carolina seceded on Dec. 20, 1860. South Carolina claimed that, with the dissolution of

THEY DON'T "HUNT HEADS" ANY MORE



Some of the savage inhabitants of Formosa still enjoy the gruesome sport of collecting the heads of their enemies. The natives you see here, however, have been fairly well tamed. They use their long knives now for peaceful purposes only. Those bright-striped gowns are made by picking blankets apart and weaving the material on hand-looms, and the conical objects on the ground are the popular style in Formosan hats.

she the which bound her to the Union, she had a right to all the United States' property within her limits. President Buchanan refused to hand over the forts within the seceded states, but agreed not to send reinforcements.

When the dispute began, Fort Sumter was unoccupied, but Major Robert Anderson soon moved his small garrison into Sumter from Fort Moultrie, a weaker fortification in the same harbor. Fort Sumter was really besieged from this time until the outbreak of the war. On April 11, Gen. P. G. T. Beauregard, in command of the Confederate forces, demanded its surrender. Major Anderson refused at daybreak, and on April 12 the bombardment began. Against overwhelming odds the Union troops held out until honor was satisfied. Major Anderson was forced to surrender on April 13, announcing his surrender in the following dispatch to Washington:

Having defended Fort Sumter for 34 hours, until the quarters were entirely burned, the main guns destroyed, the powder-magazine surrounded by flames, and no provisions but pork remaining, I accepted the terms of evacuation offered by General Beauregard, and marched out of the fort with colors flying and drums beating, saluting my flag with 50 guns.

Men at the North who had calmly been saying, "Let the South go," were now aroused to fever heat and enlisted in response to Lincoln's call for 75,000 men. The North gained much in unity of action by the loss of Fort Sumter; the South gained only the fort, which however they held until 1865. When the Confederate forces abandoned Charleston in that year, Fort Sumter again passed to the North, but as a battered ruin of no military importance.

FORTUNA. The goddess of fortune was more worshiped by the Romans than by the Greeks, though they also recognized her under the name of Tyche. By some she was considered a sister of the Fates. She differed from them, however, in working without law, conferring joy or sorrow as she pleased. Greek poets and sculptors represented her with a rudder, with a ball or wheel, or with wings. The Romans proudly said that when Fortuna entered their city, she threw away her ball and put off her wings and shoes, to indicate she would remain forever.

FORT WILLIAM, ONTARIO. At the head of Lake Superior stands the thriving city of Fort William, three miles from its sister city, Port Arthur. Enormous grain elevators, looming large on the horizon, explain the reason for the existence of these towns; for the head of the lake is the funnel through which passes most of the wheat yielded to the world by the great prairies of the Canadian Northwest.

After the grain is harvested in Manitoba, Saskatchewan, and Alberta, long freight trains bring it to these great elevators, which combined can store more than 60,000,000 bushels at one time. From the elevators the grain is loaded on boat or train, as it is needed, and sent to the United States, to eastern Canada, or to England. Its advantages of location also make Fort William the greatest coal-handling

center of western Canada. Flour mills, foundries, stove works, wood-working plants, shipyards, and many other industries have been attracted by the excellent shipping facilities of these twin cities.

The electric light plants, street railways, and telephone systems in both Fort William and Port Arthur are municipally owned and operated. The name Fort William recalls that the town was first a trading station of the Northwest Fur Company. In those days schooners lay awaiting their loads of furs, where today enormous steamers receive their burdens of wheat from rows of the biggest elevators in North America. Population of Fort William, 23,277; of Port Arthur, 19,818.

FORT WORTH, TEX. Its situation in the heart of northern Texas has made Fort Worth one of the state's thriving and prosperous manufacturing cities. To the east of it is a rich farming country, and to the west and north lie the great oil fields of the region and extensive cattle ranges. Most of the trunk railway lines converge here, making the city one of the chief shipping centers of the Southwest for grain, cotton, and livestock. The municipal airport is a center for trans-continental and north-and-south air lines. About a dozen oil pipe lines enter the city, and there are several pipe lines for natural gas. The cheap fuel thus provided and large deposits of bituminous coal near by have helped in Fort Worth's manufacturing development.

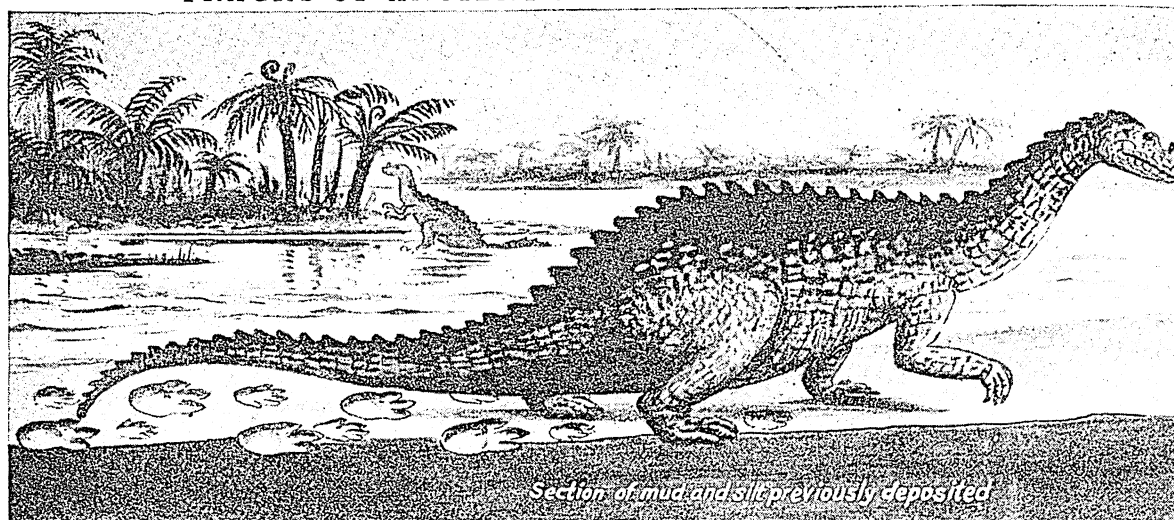
The city's varied industrial establishments include large packing houses, grain elevators, oil refineries, car repair shops, flour and feed mills, rolling mills, foundries and machine shops, and manufactories of textiles, clothing, and cement. It is also the seat of Texas Christian University, Texas Wesleyan College, and the Southwestern Baptist Theological Seminary.

The city is built on rolling country, and in its development advantage has been taken of this natural circumstance. There are more than 40 parks, including Lake Worth, six miles northwest of the city. Here an enormous dam 3,500 feet long has been constructed on the Trinity River to provide a reservoir for the city's water supply.

For a few years after the Mexican War, Fort Worth was a military post, to protect the scattered settlers from Indian attacks. When the railroads began to reach the settlement in the late 70's and early 80's, the cattlemen made Fort Worth their headquarters, and its real growth began. The development of the southwestern oil fields gave the city another great impetus, and by 1925 Fort Worth was the world's greatest oil pipe-line center. Incorporated in 1873, it adopted council-manager government in 1925. Population (1940 census), 177,662.

FOSSILS. Did you know that if you should start digging deep down under your own house, you might find the remains of strange animals and plants, unlike anything alive today—the bones of huge monsters that perished millions of years ago; the trunks of ancient trees turned to stone; the molded

TRACKS OF ANCIENT MONSTERS IN THE ROCKS



In far-off Jurassic times the climate of North America was moist and hot, and what is now prairie land was a swampy wilderness filled with soft marsh vegetation and fernlike trees. Through these forests and around the marshes roamed great reptiles, like the dinosaur in the picture. Most of the footprints they left in the mud were washed out; but occasionally the mud hardened, and then was overlaid with mud of another kind which did not unite with the lower layer. As time went on and more mud was deposited, its weight hardened the lower layers into rock and thus the footprints in the lower layer were preserved in their molds, to be dug up by modern geologists.

forms of huge insects, of queer fishes and shells, of birds with teeth, of real sea-serpents, of hundreds of other relics of bygone ages? Not all these things would be found in any one place, to be sure, but all such things have been found in places very widely distributed over the earth.

Such relics are called "fossils," from the Latin word meaning "to dig." By studying them, scientists have been able to piece together some of the most important pages in the history of the earth and its inhabitants. They have proved, for instance, that the rocks in the Rocky Mountains, the Alps, and the great Himalayas were once below the level of the ocean, for the remains of sea animals have been found high up on their slopes. From fossils we have learned also that the forebears of the camel once roamed the plains of

North America; that tropical forests once covered the United States and Europe, and a luxuriant vegetation grew where the Polar regions now exist.

Fossils have told us that the great coal and chalk beds of the world were formed from the remains of living things, and that millions of years before the pyramids of Egypt were dreamed of, tiny animals were making shells which became the limestone of which parts of those pyramids are built.

Fitting together the scattered parts of the fossil story, science has traced animal life back to the earliest worms and shell-fish, and has shown how, one after another, appeared the cartilaginous fishes like sharks, the amphibians (half-land, half-water animals like the frog), the insects, the reptiles, the birds and bony fishes, and, last of all, the mammals.

Fossil plants and fossil animals are found in many forms. In some cases a fossil is only the footprint of some prehistoric beast in the mud of bygone ages which has been buried and preserved under a fresh layer of sand or silt. In some cases it is the delicate imprint of a leaf on some soft material which later hardened into solid rock. Sometimes the body of an animal was buried and decayed, leaving a hollow mold which filled up with mineral matter forming a cast of the animal's shape. Sometimes the bones and teeth themselves have survived in a favorable spot. In a few rela-

tively recent cases even the flesh of the creature has been preserved, as in the case of the mammoths imbedded in the frozen mud cliffs of Siberia for thousands of years, whose meat was so fresh that it was said to have been eaten with relish by the hungry natives of the region.

The science of fossils is called Paleontology, and to understand fully its importance you should read the articles on Evolution and Geology. Here, we can only mention some of the more amazing discoveries, mostly made within the last 50 years.

Many strange relationships have been made known, based upon the fossils of some of the animals which came into existence in the early days of the world's history. The seal and the elephant are believed by some men of science to have had a common ancestor, while such widely different creatures as the moose, the giraffe, the hippopotamus, the sheep, the pig, and the camel, are said to spring from the same class of primitive mammals, whose bones now rest in our museums. The ancestor of the modern horse, which was a tiny creature no bigger than a fox-terrier, was a close relative of the rhinoceros family (see Horse).

UNEARTHING A MEMORIAL OF A BYGONE AGE



Here the fossil remains of a monster reptile have been uncovered, after lying buried for millions of years. As you see, the scientist first removes all earth and rock surrounding the fossil, then carefully reinforces each section of the bony structure with special materials to strengthen it before removing it completely from the ground.

The strangest of all creatures which have been dug up out of the earth are the giant monsters of the Reptile Age—the dinosaurs, the ichthyosaurs, and other scaled, horny creatures of dragon-like mien (see Animals, Prehistoric). Some of these old reptiles

SOME ANCIENT "CHINA EGGS"



These dinosaur eggs, several million years old, were unearthed in the Mongolian desert by an American expedition. Careful restoration by museum experts revealed the remains of unhatched young dinosaurs in some of them.

were about 100 feet long and certainly the largest land animals that ever lived. These illustrate most exactly a law gleaned from the study of fossils—that the farther back we go the smaller do we find the proportion of brain space in the animal's skull. This perhaps explains why they died out despite their size and strength, and made way for creatures with more brain and less bulk. The latest of all fossil remains are those of early man, found with the bones of the great animals—the mammoth, the bison, the cave-bear—which he, thanks to his superior brain, was able to kill for food (see Cave Dwellers).

Although most lands yield fossils, both the United States and Canada are noted for their particularly rich remains of the larger reptiles and mammals. Among the most famous deposits are those of Wyoming, Nebraska, South Dakota, and Colorado. Rancho La Brea in Los Angeles, Calif., is

the most spectacular fossil area in the United States. Its sticky pools of oil and asphalt trapped thousands of prehistoric animals much as flypaper catches flies. Saber-tooth tigers, giant wolves and sloths, mastodons, short-faced bears, and horses have been uncovered here in a remarkable state of preservation.

Fossil Remains Used in Industry: Diatomite

Some types of fossil deposits have considerable industrial importance today, especially chalk (*see* Chalk) and diatomite. Diatomite is the fossil remains of microscopic plants called diatoms, which live in fresh and salt water (*see* Ocean), and even in damp soil. In the polar regions they are so dense that they color the snow and ice. Their flinty skeletons are deposited on the floors of the world's seas, lakes, rivers, and swamps, and on ancient sea beds. These gray-white deposits, called diatomite, diatomaceous earth, kieselguhr, or infusorial earth, are mined in California, Nevada, Washington, and other states, and in Germany, Denmark, Russia, Algeria, Japan, and France. Diatomite is used as a filter in sugar and oil refining, as an insulator against heat and sound, as a rubber and cement filler, and as an abrasive in dentifrices and metal polishes.

FOSTER, STEPHEN COLLINS (1826-1864). "That's it!" exclaimed a song writer one day in 1851 when his brother pointed out in an atlas the Suwanee River. He picked up the manuscript of his new song and changed the name of the river it celebrated from "Pedee" to the more poetic "Swanee." Then 'Old Folks at Home', one of the most beloved compositions ever written, was ready for publication.

Stephen C. Foster, born at Lawrenceville, Pa. (now a part of Pittsburgh), July 4, 1826, was then 25 years of age. When he was 30, about 200,000 copies of 'Old Folks at Home' had been sold, but his account book shows he received less than \$1,700 in royalties.

Though he had little education, Foster had learned to sing and to play various musical instruments. Writing melodies and words that express the deeply cherished sentiments of the American spirit, and indeed

of the human spirit the world over, seemed to be as easy for him as breathing. In some 20 years he composed over 200 numbers; and he had ceased writing only a few days before a friend took him from a dismal basement room in New York City to Bellevue Hospital, where he died in a fever Jan. 13, 1864. Improvident, care-free, sympathetic, generous—he lived and died as had other geniuses before him. In 1850 he had married Jane McDowell, from a prominent Pittsburgh family.

Many of Foster's songs are popular today, notably 'Old Folks at Home', 'My Old Kentucky Home', 'Massa's in de Cold Ground', 'Old Black Joe', 'Oh! Susanna', 'Jeanie with the Light Brown Hair', 'Come Where My Love Lies Dreaming', 'Beautiful Dreamer', 'Camptown Races', 'Nelly Was a Lady', 'Nelly Bly', and 'Old Dog Tray'. In addition to plantation melodies and songs of sentiment, his compositions include many hymns.

Numerous memorials honor Foster's memory. The Foster Hall Collection at the University of Pittsburgh is visited by his devotees from many parts of the world. A dormitory, Foster Hall, at the Eastman School of Music in Rochester, N. Y., is named in his memory. Five bridges across the Suwanee River in Florida are dedicated to him, and the state song is 'Old Folks at Home'. At Fargo, Ga., a memorial shaft rises near the source of the Suwanee. Kentucky honors him with a state shrine at Bardstown, and 'My Old Kentucky Home' is the state song.



Stephen Foster
America's Favorite Song Writer

A PRIZE-WINNING CORN PROJECT



This 4-H Club member is justly proud of his project. Raising prize corn means hard work and knowledge of the most scientific methods.

4-H CLUBS. No organization in the country is doing more to raise the standards of rural life and to enrich the outlook of farm boys and girls than the 4-H Clubs. This is the largest rural youth organization in the world, with more than a million members pledged to the fourfold development of Head, Heart, Hands, and Health. The pledge is:

I Pledge { My Head to clearer thinking,
My Heart to greater loyalty,
My Hands to larger service, and
My Health to better living, for
My Club, my Community, and my Country.

The motto is, "To make the best better." The badge is a green four-leaf clover with a white "H" on each leaf.

The clubs are sponsored by the United States Department of Agriculture and the state agricultural colleges. The movement began at the



turn of the century, gaining impetus in 1914 when the Smith-Lever Act provided funds for the development of junior extension work. It has been growing at the rate of about 100,000 members a year. Similar organizations have been formed in Canada and other countries. Each 4-H Club comprises five or more members between 10 and 20 years of age. The county extension agent supervises the organization and approves programs. The members usually work on the same project under a local leader. Each conducts a substantial piece of work designed to show some better practise on the farm, in the home, or in the community. At the completion of the project the club holds an Achievement Day program, and competes with other clubs at the state fair.

The girls may refurbish a room, make a costume, or grow a vegetable garden and can the surplus. The boys may grow an acre of corn, wheat, or some other crop. Either boys or girls may raise a flock of poultry, a prize beef, or a litter of pigs. They reforest their farms, landscape the home grounds, purify their water supplies, check erosion, control insect and weed pests, and create wild game preserves. They earn money for their higher education by selling their pure-bred stock. To raise funds some clubs put on pageants or plays, making their own costumes and stage properties; others give orchestral or band concerts with instruments bought from sales of their own produce. Members take substantial cash prizes at state fairs and at the International Livestock Exposition at Chicago. By their example, 4-H Club members often introduce modern methods to the older people in their community.

Every June two boys and two girls from each state are sent to the National 4-H Club Camp at Washington, D. C., and every November a group of about 50 from each state attend the National 4-H Club Congress, held in Chicago at the same time as the International Livestock Exposition.

The National Committee on Boys and Girls Clubs, with headquarters in Chicago, supplements the work of the Department of Agriculture. This is a privately supported organization which acts as a clearinghouse for 4-H Club affairs. It publishes a newspaper, directs

the programs of the National Congress, and raises funds for scholarships and prizes.

FOX. The fox has been justly celebrated in folklore as the slyest of beasts. In England, where it is carefully preserved for the sport of fox hunting, many tales are told of its cleverness in throwing

hounds off the scent and in eluding them when apparently cornered. Its ability to survive by stealth and guile is proverbial even in countries where the fox is ruthlessly shot, trapped, and poisoned to obtain its fur and to check its

thefts of poultry.

The fox is closely related to the dog and the jackal, but is distinguished from them by its sharp muzzle, its erect ears, the elliptical pupil of its eye, and its bushy tail. One or another of the many kinds of foxes is found in Europe, Asia, Africa, and North America, with some near relatives in South America. In North America the commonest kind is the red fox, which is similar to the common fox of Europe.

The red fox is a handsome and graceful animal. The male

grows 41 inches long, including its plumelike tail, which measures about 16 inches. Upper parts of the body are reddish yellow; under parts and tip of tail are white. Feet and lower forelegs are black.

A freak offspring of the red fox is the black, or silver, fox, with fur of black hairs tipped with gray. It is rarely found wild, and its fur sold at enormous prices until recent years when experts began to breed and raise silver foxes on farms in Canada, the United States, and northern Europe.

Intermediate between the red and the silver is the cross fox, so called because the black markings on its shoulder and back resemble a cross. Most of the fur, however, is reddish yellow.

The Arctic fox, which ranges southward to Labrador and Newfoundland, has beautiful silky fur, dark brown to light yellow in summer, but pure white in winter. A freak offspring is the blue fox with fur the color of blue smoke. It is rare in the wild state, but, like the silver fox, is raised on farms for its pelt.

Of low rank in the fur trade is the gray fox. This is seldom found north of the Great Lakes. Its range extends east to the Atlantic, west to the Pacific,

FUTURE LEADERS IN AMERICAN RURAL LIFE



The boys are being shown how to judge their beef cattle, an important part of every live stock project. Canned vegetables from her own garden will help feed the girl's family through the coming winter.

and south to Texas. The gray fox closely resembles the red fox, but has slightly longer legs. It is more timid and often climbs low trees.

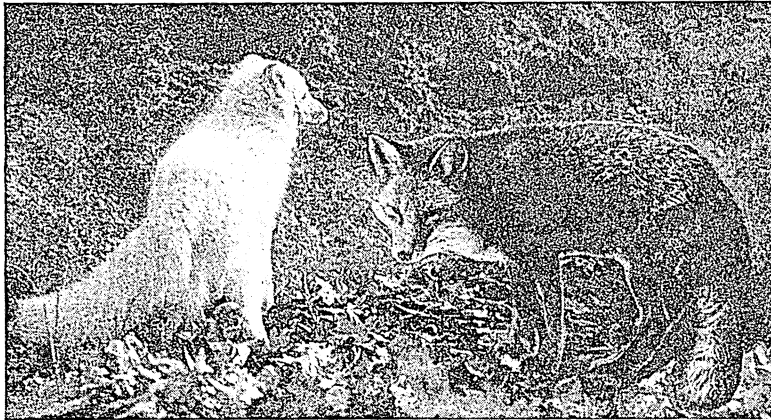
All foxes are burrowing animals, though they sometimes make their homes in hollow stumps or rock crev-

utters a piercing yelp at mating time. She bears her young in the spring, from three to nine in a litter.

One of the favorite folk tales of the Middle Ages was the beast-epic of 'Reynard the Fox'. The hero's name means "strong in counsel" or "keen-witted."

Because of his misdeeds, Reynard is summoned many times to appear before Noble the Lion, King of Beasts, to answer charges brought against him by Isengrim the Wolf, Bruin the Bear, Chanticleer the Cock, and others. But each time Reynard's sharp wits save him.

The ancient Reynard tales have been traced to many sources, some even to India. As a group, they took popular form in the borderlands between France and Germany, and appeared as a written collection of poems about the middle of the 12th century, first in French, then in German and English. So popular were they in France that the original form of the hero's



The Arctic fox, on the left, and the red fox are both beautiful creatures. But their beauty is their undoing for they are trapped and killed in great numbers for the sake of their sleek coats.

ices. They hide by day, and by night they hunt birds and small animals, such as gophers and rabbits. Occasionally, they eat frogs, fish, insects, and berries. Among the calls of the fox are a curt yapping bark and a shrill howl. The female fox, called a "vixen,"

name, *Renart* (later *Renard*), became the common French word for fox, displacing the older word *goupil*.

Scientific name of European red fox, *Vulpes vulpes*; of American red fox, *Vulpes fulva*; of Arctic fox, *Alopex lagopus*; of American gray fox, *Urocyon cinereoargenteus*.

COMMON FRACTIONS and How to MASTER THEM

FRACTIONS. If we fold a sheet of paper (Fig. 1A) so as to bring the ends together, the crease made by the folding will divide the paper into two equal parts or *halves*, as in B.



Fig. 1 These parts—halves, fourths, etc.—are called *fractions*. They are direct relations of quantity and do not depend upon measuring.

Halves

1. How many halves in 1? (See Fig. 1B.)

2. What is $\frac{1}{2}$ of 3? $\frac{1}{2}$ of 5? $\frac{1}{2}$ of 7? $\frac{1}{2}$ of 9? Draw lines 3 inches long, 5 inches long, etc. Divide each in half and measure.

$$3. \text{ Add: } \begin{array}{r} 2\frac{1}{2} \\ 2\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 3\frac{1}{2} \\ 3\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 4\frac{1}{2} \\ 4\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 3\frac{1}{2} \\ 4\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 6\frac{1}{2} \\ 7\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 6 \\ 5\frac{1}{2} \\ \hline \end{array}$$

4. Subtract:

$$\begin{array}{r} 7 \\ 3\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 9 \\ 4\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 8 \\ 3\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 12 \\ 4\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{1}{2} \\ 2\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 18\frac{1}{2} \\ 7\frac{1}{2} \\ \hline \end{array}$$

To solve $7 - 3\frac{1}{2}$, draw a line 7 inches long. Cut off $3\frac{1}{2}$ inches. How much is left?

Fourths

Cut out pieces of paper like those shown in Fig. 2: (a) 4 inches square; (b) 2 inches by 4 inches; (c) 2 inches by 2 inches; (d) irregular form 4 inches by 4 inches on the long sides; (e) 4 inches square, creased into fourths. Write the fraction name on each form.

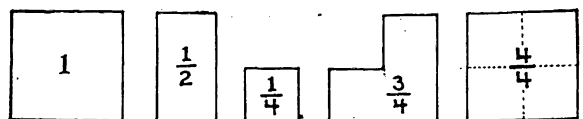


Fig. 2

1. Compare $\frac{1}{2}$ with two of the $\frac{1}{4}$ forms put end to end; $\frac{3}{4}$ with three of the $\frac{1}{4}$ forms; 1 with $\frac{4}{4}$.

2. Study the picture problems in Fig. 3. Place $\frac{1}{4}$ and $\frac{1}{2}$ together. Which fraction could be covered by their sum? Place $\frac{1}{4}$ and $\frac{3}{4}$ together. Which form does their sum equal? Place two of the $\frac{3}{4}$ forms together. What fraction must be added to 1 to equal their sum?

$$\frac{1}{4} + \frac{1}{2} = \frac{3}{4}$$

$$\frac{1}{4} + \frac{3}{4} = 1$$

$$\frac{3}{4} + \frac{3}{4} = 1 \frac{1}{2}$$

Fig. 3

5. Add: $8\frac{1}{2} + 4\frac{1}{4} = 12\frac{3}{4}$, $7\frac{1}{2} + 3\frac{1}{4} = 10\frac{3}{4}$, $2\frac{1}{2} + 2\frac{1}{4} = 4\frac{3}{4}$, $5\frac{1}{2} + 1\frac{1}{4} = 6\frac{3}{4}$, $8\frac{1}{2} + 4\frac{1}{4} = 12\frac{3}{4}$, $7\frac{1}{2} + 3\frac{1}{4} = 10\frac{3}{4}$, $2\frac{1}{2} + 2\frac{1}{4} = 4\frac{3}{4}$, $5\frac{1}{2} + 1\frac{1}{4} = 6\frac{3}{4}$

6. Place $\frac{3}{4}$ on 1. Which other unit added to $\frac{3}{4}$ will cover the 1? Then $1 - \frac{3}{4} =$ what?

7. Place $\frac{1}{4}$ on 1. How much added to $\frac{1}{4}$ will equal 1? Then $1 - \frac{1}{4} =$ what?

8. Similarly find $\frac{3}{4} - \frac{1}{4}$; $\frac{3}{4} - \frac{1}{2}$.

9. Subtract: $7\frac{1}{2} - 3\frac{1}{4} = 4\frac{1}{4}$, $13\frac{3}{4} - 6\frac{1}{2} = 7\frac{1}{4}$, $8\frac{1}{2} - 4\frac{1}{4} = 4\frac{1}{4}$, $10\frac{1}{2} - 5\frac{1}{4} = 5\frac{1}{4}$

Draw a line $7\frac{1}{2}$ inches long. Cut off $6\frac{1}{4}$ inches. How much is left? Measure.

10. Place $\frac{1}{4}$ with 1 so as to make $1\frac{1}{4}$. Find two fractions whose sum equals $1\frac{1}{4}$; also $1\frac{1}{2}$.

11. Subtract: $6\frac{1}{2} - 3\frac{1}{4} = 3\frac{1}{4}$, $9\frac{1}{4} - 4\frac{1}{2} = 4\frac{1}{4}$, $7\frac{1}{2} - 3\frac{3}{4} = 3\frac{3}{4}$, $12 - 6\frac{1}{2} = 5\frac{1}{2}$, $7\frac{1}{2} - 3\frac{1}{4} = 4\frac{1}{4}$, $12\frac{3}{4} - 6\frac{3}{4} = 6$

Prove the results by drawing lines and cutting off the subtracted part, then measuring the remainder.

Eighths

Cut pieces of paper like the shapes in Fig. 4. Let the 1 be 4 inches by 4 inches, the $\frac{1}{2}$, 2 inches by 4, etc.

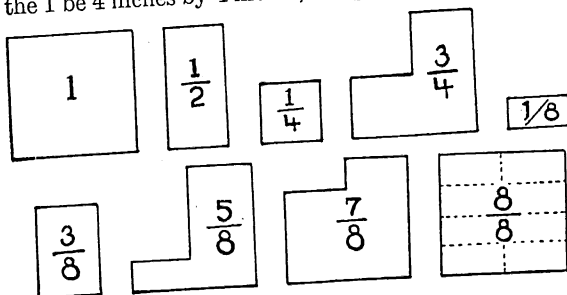


Fig. 4

Make sums and differences as in the exercises with fourths.

1. Which fraction equals $\frac{4}{8}$? Which one equals $\frac{3}{8}$? Which equals $\frac{5}{8}$? Changing $\frac{4}{8}$ to $\frac{1}{2}$ or $\frac{8}{8}$ to 1 is called *reducing to lowest terms*.

2. Place $\frac{1}{8}$ with each of the other forms to find sums.

3. Add: $4\frac{1}{8} + 7\frac{1}{8} = 11\frac{2}{8} = 11\frac{1}{4}$, $2\frac{1}{8} + 9\frac{1}{8} = 11\frac{2}{8} = 11\frac{1}{4}$, $6\frac{1}{8} + 5\frac{1}{8} = 11\frac{2}{8} = 11\frac{1}{4}$, $5\frac{1}{8} + 6\frac{1}{8} = 11\frac{2}{8} = 11\frac{1}{4}$, $7\frac{1}{8} + 4\frac{1}{8} = 11\frac{2}{8} = 11\frac{1}{4}$, $3\frac{1}{8} + 8\frac{1}{8} = 11\frac{2}{8} = 11\frac{1}{4}$

Verify the results by drawing lines $4\frac{1}{8}$ inches and $2\frac{1}{8}$ inches long, end to end, and measuring; and so with the remaining examples.

4. Add: $2\frac{1}{4} + 7\frac{1}{4} = 9\frac{2}{4} = 9\frac{1}{2}$, $3\frac{1}{4} + 6\frac{1}{4} = 9\frac{2}{4} = 9\frac{1}{2}$, $2\frac{1}{4} + 7\frac{1}{4} = 9\frac{2}{4} = 9\frac{1}{2}$, $3\frac{1}{4} + 6\frac{1}{4} = 9\frac{2}{4} = 9\frac{1}{2}$

Verify the results as before.

5. Add: $3\frac{3}{8} + 4\frac{3}{8} = 7\frac{6}{8} = 7\frac{3}{4}$, $3\frac{3}{8} + 5\frac{3}{8} = 8\frac{6}{8} = 8\frac{3}{4}$, $7\frac{3}{8} + 6\frac{3}{8} = 13\frac{6}{8} = 13\frac{3}{4}$, $8\frac{3}{8} + 5\frac{3}{8} = 13\frac{6}{8} = 13\frac{3}{4}$

In solving $6\frac{3}{8} + 3\frac{3}{8}$, notice that $\frac{6}{8} + \frac{3}{8} = \frac{9}{8}$; but $\frac{9}{8}$ is greater than 1 or $\frac{8}{8}$. Therefore $\frac{9}{8} = 1\frac{1}{8}$. Changing $\frac{9}{8}$ to $1\frac{1}{8}$ is called *reducing the improper fraction* $\frac{9}{8}$ to a *mixed number* ($1\frac{1}{8}$). In solving $8\frac{3}{8} + 2\frac{3}{8}$ notice that $1\frac{0}{8} = \frac{5}{4} = 1\frac{1}{4}$.

6. Subtract: $11\frac{1}{4} - 12\frac{3}{4} = -1\frac{2}{4} = -\frac{1}{2}$, $12\frac{1}{2} - 5\frac{5}{8} = 6\frac{4}{8} - 5\frac{5}{8} = 1\frac{3}{8}$, $9\frac{3}{4} - 3\frac{1}{8} = 6\frac{6}{8} - 3\frac{1}{8} = 3\frac{5}{8}$, $13 - 9\frac{1}{8} = 3\frac{7}{8}$

Verify the last two by drawing lines $7\frac{3}{8}$ inches and 13 inches long and cutting off the measurements as indicated.

7. Which fraction is contained 6 times in $\frac{3}{4}$? Use the different forms in Fig. 4 and measure. Which is contained 3 times in $\frac{3}{4}$?

8. Fill the blanks:

$\frac{1}{6}$ of $\frac{3}{4} =$ $6 \times = \frac{3}{4}$, $\frac{1}{3}$ of $\frac{3}{4} =$ $3 \times = \frac{3}{4}$, $\frac{1}{2}$ of $\frac{3}{4} =$ $\frac{3}{4} \div 1\frac{1}{2} =$, $\frac{3}{4} \div 6 =$, $\frac{3}{4} \div \frac{1}{6} =$, $\frac{1}{6}$ of $\frac{3}{4} =$

9. Which form equals $\frac{3}{4}$ of $\frac{3}{4}$? Find one that covers $\frac{3}{4}$ of $\frac{3}{4}$. Then $\frac{3}{4} \times \frac{3}{4} =$? (Read the sign \times as "of.")

10. Which form of Fig. 4 is contained 5 times in $\frac{5}{8}$? Then $\frac{5}{8} \div 5 =$?

11. Find $\frac{1}{4} \times$ (of) $\frac{7}{8}$; $\frac{2}{3} \times \frac{7}{8}$; $\frac{3}{4} \times \frac{7}{8}$; $\frac{4}{5} \times \frac{7}{8}$. (Find forms to cover $\frac{1}{4}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, etc., of $\frac{7}{8}$.)

12. Add: $3\frac{5}{8} + 4\frac{5}{8} = 7\frac{10}{8} = 8\frac{5}{4} = 9\frac{1}{4}$, $5\frac{5}{8} + 2\frac{5}{8} = 7\frac{10}{8} = 8\frac{5}{4} = 9\frac{1}{4}$, $2\frac{5}{8} + 9\frac{5}{8} = 11\frac{10}{8} = 12\frac{5}{4} = 13\frac{1}{4}$, $6\frac{5}{8} + 3\frac{5}{8} = 9\frac{10}{8} = 10\frac{5}{4} = 11\frac{1}{4}$, $7\frac{5}{8} + 2\frac{5}{8} = 9\frac{10}{8} = 10\frac{5}{4} = 11\frac{1}{4}$

In solving these problems notice that: $1\frac{0}{8} = \frac{5}{4} = 1\frac{1}{4}$; $1\frac{1}{8} = 1\frac{1}{8}$; $1\frac{2}{8} = 1\frac{1}{4} = 1\frac{1}{4}$.

Thirds

Cut forms of paper like those in Fig. 5. Let the $\frac{3}{3}$ be 3 inches square. Write the fraction names upon the forms.

Add: $3\frac{1}{3} + 6\frac{2}{3} = 9\frac{3}{3} = 10$, $7\frac{1}{3} + 6\frac{2}{3} = 13\frac{3}{3} = 14$, $8\frac{2}{3} + 4\frac{1}{3} = 12\frac{3}{3} = 13$

Subtract: $6\frac{2}{3} - 7\frac{1}{3} = -1\frac{1}{3}$, $8 - 2\frac{1}{3} = 5\frac{2}{3}$, $4\frac{1}{3} - 2\frac{2}{3} = 1\frac{2}{3}$

To solve 8 minus $2\frac{1}{3}$ use the *additive method* (like making change). Think $\frac{2}{3}$ added to $2\frac{1}{3}$ makes 3, and 5 more makes 8. We added $5\frac{2}{3}$, so 8 minus $2\frac{1}{3} = 5\frac{2}{3}$. To solve $4\frac{1}{3} - 2\frac{2}{3}$, think how much must be added to $2\frac{2}{3}$ to make $4\frac{1}{3}$. Thus $\frac{1}{3}$ more makes 3, 1 more makes 4, and $\frac{1}{3}$ more makes $4\frac{1}{3}$. We added $1\frac{2}{3}$, so $4\frac{1}{3} - 2\frac{2}{3} = 1\frac{2}{3}$.

Fig. 5

Sixths

Cut forms as in Fig. 6, making the $\frac{1}{6}$ either 3 inches or 6 inches square. Write the fraction names upon the forms.

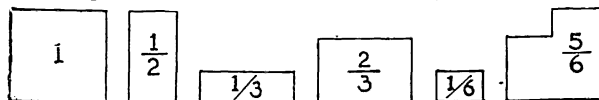


Fig. 6

1. Make sums by placing any two forms together.
Example: $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$.
2. Observe the forms and answer: What fraction equals $\frac{2}{3}$? $\frac{4}{6}$?
3. Place $\frac{1}{3}$ on $\frac{2}{3}$ and tell what part of the $\frac{2}{3}$ is covered. What part of $\frac{2}{3} = \frac{1}{3}$?
4. Show that $\frac{2}{3} \div \frac{1}{3} = 2$; $\frac{3}{3} \div \frac{1}{3} = 3$; $\frac{1}{3} \div \frac{1}{3} = 1$.
5. Show $\frac{1}{3} + \frac{1}{3}$ and give the sum; $\frac{1}{3} + \frac{1}{3}$; $\frac{1}{3} + \frac{1}{3}$;
6. Change $\frac{1}{3}$, $\frac{2}{3}$ to lowest terms.
7. Add:
$$\begin{array}{r} 5\frac{1}{6} \\ 4\frac{1}{6} \\ \hline 9\frac{2}{6} \end{array}$$
8. Lay the form $\frac{1}{6}$ on the form $\frac{1}{3}$; on $\frac{2}{3}$; on $\frac{5}{6}$. How many sixths remain uncovered in each case? Change the remainder to lowest terms in each case.
9. Subtract:
$$\begin{array}{r} 5\frac{1}{6} \\ 4\frac{1}{6} \\ \hline 1\frac{0}{6} \end{array}$$
10. Lay the form $\frac{1}{6}$ on the form $\frac{1}{3}$; $\frac{1}{6}$ on $\frac{2}{3}$; $\frac{1}{6}$ on $\frac{5}{6}$; on 1. How many sixths are left uncovered in each case?
11. Subtract:
$$\begin{array}{r} 7\frac{1}{6} \\ 3\frac{1}{6} \\ \hline 4\frac{0}{6} \end{array}$$
12. Show $\frac{1}{3} + \frac{1}{3}$; $\frac{1}{3} + \frac{2}{3}$; $\frac{1}{3} + \frac{5}{6}$; $\frac{2}{3} + \frac{5}{6}$. Reduce $\frac{1}{3}$ to a mixed number. Reduce $\frac{2}{3}$ and $\frac{5}{6}$ to lowest terms and then to mixed numbers.
13. Add:
$$\begin{array}{r} 3\frac{1}{6} \\ 2\frac{1}{6} \\ \hline 5\frac{2}{6} \end{array}$$
14. Show $\frac{5}{6} - \frac{1}{6}$ by laying the form $\frac{1}{6}$ on the form $\frac{5}{6}$. Which form equals the uncovered part of the $\frac{5}{6}$?
15. In the same way show $\frac{5}{6} - \frac{2}{6}$; $1\frac{1}{6} - \frac{5}{6}$; $1\frac{1}{6} - \frac{1}{6}$.
16. Show $1\frac{1}{6} - \frac{1}{6}$; $1\frac{1}{6} - \frac{2}{6}$; $1\frac{1}{6} - \frac{5}{6}$; $1\frac{1}{6} - \frac{1}{6}$.
17. Subtract:
$$\begin{array}{r} 5\frac{1}{6} \\ 3\frac{1}{6} \\ \hline 2\frac{0}{6} \end{array}$$

Solution of last:
$$\begin{array}{r} 9\frac{1}{6} \\ 5\frac{1}{6} \\ \hline 4\frac{0}{6} \end{array}$$

Add $\frac{1}{6}$ to make the subtrahend 6
Add 3 to make the subtrahend 9
Add $\frac{1}{6}$ to make the subtrahend $9\frac{1}{6}$

Answer: $3\frac{1}{6}$ total of parts added.

18. Which unit equals $\frac{1}{2}$ of $\frac{1}{3}$? $\frac{1}{4}$ of $\frac{2}{3}$? $\frac{3}{4}$ of $\frac{2}{3}$? $\frac{1}{2} \times \frac{1}{3}$? $4 \times \frac{1}{6}$? $\frac{2}{3} \times \frac{1}{3}$? Show by comparing forms. (Say " $\frac{1}{2}$ of $\frac{2}{3}$," but " 4 times $\frac{1}{6}$.")
19. Lay the form $\frac{1}{6}$ on the form $\frac{2}{3}$ to find out how many times $\frac{1}{6}$ contains $\frac{2}{3}$. Then $\frac{2}{3} \div \frac{1}{6} = 4$. $\frac{5}{6} \div \frac{1}{6} = ?$ $\frac{1}{3} \div \frac{1}{6} = ?$ $\frac{1}{6} \div \frac{1}{6} = ?$ Show.
20. Compare $\frac{1}{6}$ with $\frac{1}{3}$.
Solution: Using the form $\frac{1}{6}$ for a measure, we find it contained 3 times in $\frac{1}{3}$. We also find $\frac{1}{6}$ is $\frac{1}{2}$ as large as $\frac{1}{3}$. So $\frac{1}{6}$ is 3 times $\frac{1}{2}$ of $\frac{1}{3} = \frac{3}{2}$ of $\frac{1}{3}$.
21. Compare $\frac{1}{6}$ with $\frac{2}{3}$.
Solution: $\frac{1}{6}$ contains $\frac{2}{3}$ 2 times. But $\frac{1}{6} = \frac{1}{3}$ of $\frac{1}{2}$. (Show this.) So $\frac{1}{6}$ is $\frac{2}{3}$ of $\frac{1}{2}$.
22. Compare $\frac{1}{6}$ with $\frac{5}{6}$. Use $\frac{1}{6}$ to measure $\frac{5}{6}$. $\frac{1}{6} = \frac{1}{6}$ of $\frac{5}{6}$. (Show this by measuring $\frac{5}{6}$ with $\frac{1}{6}$ as a measure.) So $\frac{5}{6} = 5$ times $\frac{1}{6}$ of $\frac{5}{6}$, or $\frac{5}{6}$ of $\frac{5}{6}$.
23. $\frac{1}{6} =$ what part of $\frac{2}{3}$? In the last problem $\frac{1}{6} = \frac{1}{3} \times \frac{2}{3}$, but since measure is expressed by division, $\frac{1}{6} \div \frac{2}{3} = \frac{1}{4}$ ($\frac{1}{6}$ compared with or divided by $\frac{2}{3}$ gives $\frac{1}{4}$ as a quotient).
24. $\frac{2}{3} \div \frac{5}{6} =$ what?
Solution: This means: $\frac{2}{3}$ is what part of $\frac{5}{6}$? Using $\frac{1}{6}$ as a measure, $\frac{2}{3}$ is found to be 4 times as great as $\frac{1}{6}$. But $\frac{1}{6}$ is $\frac{1}{5}$ as great as $\frac{5}{6}$. So $\frac{2}{3}$ is 4 times as much as $\frac{1}{5}$ of $\frac{5}{6}$, or $\frac{4}{5}$ of $\frac{5}{6}$. Therefore, $\frac{2}{3} \div \frac{5}{6} = \frac{4}{5}$.

Twelfths

1. Cut a form one-half as large as $\frac{1}{6}$. How many such units does 1 contain? Call it $\frac{1}{12}$. $\frac{1}{2}$ of $\frac{1}{6} = \frac{1}{12}$.
2. Measure the form $\frac{1}{12}$, using the form $\frac{1}{12}$ as a measure. $\frac{1}{12} =$ how many twelfths?
3. In the same way change $\frac{1}{3}$ to twelfths. Change $\frac{2}{3}$ to twelfths. Lay form $\frac{1}{12}$ on form $\frac{1}{3}$.
4. Make a form 3 times as large as $\frac{1}{12}$. Apply this $\frac{1}{4}$ to the 1. $\frac{1}{4} =$ what? $\frac{1}{2} =$ what?
5. In the same way reduce $\frac{1}{12}$, $\frac{1}{6}$, $\frac{1}{3}$, and $\frac{5}{6}$ to their lowest terms.
6. Reduce $\frac{1}{12}$ and $\frac{1}{6}$ to lowest terms. How can $\frac{1}{10}$ be reduced to lowest terms? $\frac{2}{10}$? $\frac{3}{10}$?

Rule. To reduce a fraction to its lowest terms divide its numerator (the number above the line) and denominator (the number below the line) by the same number. Do it again and again if necessary until no number will exactly divide both.

7. Change $\frac{1}{12}$, $\frac{1}{6}$, $\frac{1}{3}$, $\frac{5}{6}$, $\frac{2}{3}$ to twelfths.
8. Write $\frac{1}{12}$, $\frac{2}{12}$, $\frac{3}{12}$, $\frac{4}{12}$, etc., in order, to $\frac{11}{12}$, changing each fraction that can be so reduced, to its lowest terms.

9. Add $\frac{1}{12}$ and $\frac{1}{12}$.
Solution: To solve $\frac{1}{12} + \frac{1}{12}$, $\frac{1}{12} - \frac{1}{12}$, $\frac{2}{12} + \frac{1}{12}$, or $\frac{2}{12} - \frac{1}{12}$ it was found necessary to change the fractions to sixths. Likewise we cannot add thirds and fourths any more than we can add pecks and quarts, unless they are reduced to fractions of like denomination, that is, having the same denominator. We can add $\frac{1}{4}$ and $\frac{1}{4}$ or $\frac{2}{4}$ and $\frac{2}{4}$ or $\frac{3}{4}$ and $\frac{3}{4}$ because they are like in kind or of same denomination (have same denominator). Now, how can we reduce $\frac{2}{3}$ and $\frac{1}{4}$ to other fractions of the same value as $\frac{2}{3}$ and $\frac{1}{4}$ but having the same denominator? Consult Problem 7 above. $\frac{2}{3} = \frac{8}{12}$ and $\frac{1}{4} = \frac{3}{12}$. So $\frac{2}{3} + \frac{1}{4} = \frac{8}{12} + \frac{3}{12} = \frac{11}{12} = 1\frac{1}{12}$.

10. Subtract $\frac{1}{12}$ from $\frac{5}{6}$.
Solution: By reference to Problem 7 above, we see that fourths and sixths can be changed to twelfths. So $\frac{5}{6} - \frac{1}{12} = \frac{10}{12} - \frac{1}{12} = \frac{9}{12} = \frac{3}{4}$. 12 is said to be the *common denominator*, and twelfths the *common denomination*.

Common Denominators

1. Add $\frac{1}{3}$ and $\frac{1}{4}$.
Solution: Evidently $\frac{1}{3}$ and $\frac{1}{4}$ cannot be added until they are reduced to a common denomination. The unit or 1 thought of here must divide into 2 parts to show halves and into 5 parts to show fifths. For convenience draw a form 5 inches long and 2 inches wide. Divide it into halves by a horizontal line and into fifths by vertical lines. Each small division of this form must be $\frac{1}{10}$. Why? So tenths is the denomination we seek. $\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12} = 1\frac{1}{12}$. 10 is the common denominator.
2. To what common denomination can we change thirds and fifths? fourths and fifths? halves and sevenths? thirds and sevenths? thirds and eighths?
3. Add $\frac{5}{6}$ and $\frac{1}{4}$.
Solution: In the figure below (Fig. 7) we see that if we measure a 24-inch line with a 6-inch ruler, we say 6, 12, 18, 24; if we measure it with a 4-inch ruler, we say 4, 8, 12, 16, 20, 24.

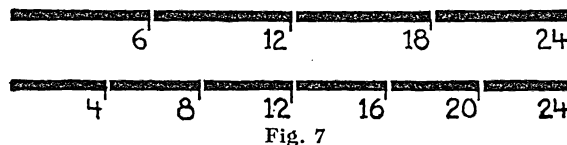


Fig. 7

20, 24. 12, 18, and 24 are *multiples* of 6; 8, 12, 16, 20, 24 are multiples of 4. We notice that 24 is found in both sets of multiples. It is therefore a *common multiple* of 4 and 6. But we notice that 12 is also a common multiple of 4 and 6 and since it is the smallest possible common multiple of 4 and 6, it is called the *least common multiple* of 4 and 6. 12 is the *least common denominator* desired and twelfths the *least common denomination* of fourths and sixths.

Hence $\frac{5}{6} + \frac{1}{4} = \frac{10}{12} + \frac{3}{12} = \frac{13}{12} = 1\frac{1}{12}$.
($\frac{1}{6} = \frac{2}{12}$; $\frac{5}{6} = \frac{10}{12}$. $\frac{1}{4} = \frac{3}{12}$; $\frac{3}{4} = \frac{9}{12}$.)

Multiplication and Division

4. Subtract $\frac{4}{9}$ from $\frac{5}{9}$.

Solution: 9, 18, 27, 36, 45, 54, multiples of 9.
6, 12, 18, 24, 30, 36, 42, 48, 54, multiples of 6.
 $6 \times 9 = 54$, a common multiple of 6 and 9.
But 18 and 36 are also common multiples of 6 and 9.

Hence 18 is the least common multiple wanted.

$$\left(\frac{5}{9} - \frac{4}{9}\right) = \frac{5}{18} - \frac{4}{18} = \frac{1}{18}$$

5. Subtract $\frac{3}{8}$ from $\frac{1}{2}$.

Hints: What is the largest number that will exactly divide 8 and 12? $8 \times 12 \div 4 = \text{what?}$

6. Reduce to a common denominator: $\frac{2}{3}, \frac{5}{6}, \frac{1}{2}$.

Hint: 6 is a multiple of 2 and also of 3.

7. Find the common denominator of $\frac{2}{3}, \frac{1}{2}, \frac{3}{4}, \frac{1}{5}, \frac{5}{6}$.

Hint: What is the smallest number the given denominators will all divide?

8. Find the common denominator of $\frac{1}{8}, \frac{1}{4}, \frac{1}{6}, \frac{1}{3}$.

Hint: Notice that 8 will exactly divide 16 and 3 will exactly divide 12. What is the least number 12 and 16 will exactly divide?

Reducing a Mixed Number to an Improper Fraction

Example: $8\frac{1}{2}$ = what?

Solution: (a) $1 = \frac{2}{2}$.
(b) $8 = 8 \times \frac{2}{2} = \frac{16}{2}$.
(c) $8\frac{1}{2} = 8 \times \frac{2}{2} + \frac{1}{2} = \frac{17}{2}$.

Reducing an Improper Fraction to a Mixed Number

Example: $\frac{44}{5}$ = what?

Solution: $\frac{44}{5} = 44 \div 5 = 8\frac{4}{5}$.

Multiplication

1. $8 \times \frac{3}{5}$ (8 times 3 fifths) = what?

Solution: $8 \times \frac{3}{5} = \frac{24}{5} = 4\frac{4}{5}$. (Multiply the numerator. Keep the denominator the same.)

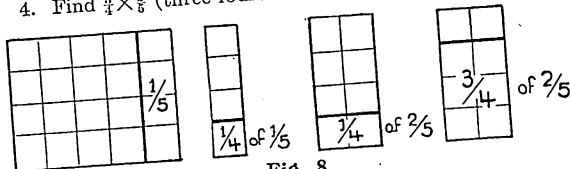
2. $\frac{3}{4} \times 8$ ($\frac{3}{4}$ of 8) = what?

Solution: $\frac{3}{4}$ of 8 = $8 \times \frac{3}{4} = \frac{24}{4} = 6$.

3. $4\frac{3}{5} \times 6\frac{1}{2}$ ($4\frac{3}{5}$ times $6\frac{1}{2}$) = what?

Solution: $4\frac{3}{5} \times 6\frac{1}{2} = \frac{9}{5} \times \frac{13}{2} = \frac{117}{10} = 11\frac{7}{10}$.

4. Find $\frac{3}{4} \times \frac{2}{5}$ (three-fourths of two-fifths).



Solution: Divide a unit (1) into fifths by vertical lines, and fourths by horizontal lines (Fig. 8). Show $\frac{1}{5}$. Divide into 4 equal parts. Show $\frac{1}{4}$ of $\frac{1}{5}$. How many parts each equal to $\frac{1}{4}$ of $\frac{1}{5}$ in a whole 1?

(a) $\frac{1}{4} \times \frac{1}{5} = \frac{1}{20}$ ($\frac{1}{4}$ of $\frac{1}{5}$).

(b) $\frac{1}{4} \times \frac{2}{5} = \frac{2}{20}$.

(c) $\frac{2}{4} \times \frac{2}{5} = \frac{4}{20} = \frac{1}{5}$.

(d) $\frac{3}{4} \times \frac{2}{5} = \frac{6}{20} = \frac{3}{10}$.

(Canceling the common factor 2 in both numerator and denominator brings the result in its lowest terms.)

5. Find $\frac{2}{3} \times \frac{3}{4}$.

Solution: $\frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{1}{2}$.

or: $\frac{2}{4} \times \frac{3}{3} = \frac{1}{2}$.

(By canceling the common factors 3 and 2 we can save a step and obtain a result in its lowest terms.)

6. Find $2\frac{2}{3} \times 6\frac{1}{2}$ ($2\frac{2}{3}$ times $6\frac{1}{2}$).

Solution: $2\frac{2}{3} \times 6\frac{1}{2} = \frac{8}{3} \times \frac{13}{2} = \frac{104}{6} = 17\frac{2}{3}$.

Division

1. Divide 5 by $\frac{1}{2}$.

Solution: (a) $1 \div \frac{1}{2} = 2$. ($4 \times \frac{1}{2} = 1$).
(b) $5 \div \frac{1}{2} = 5 \times 2 = 10$. (In 5, $\frac{1}{2}$ is contained 10 times as often as in 1.)

2. Divide 7 by $\frac{1}{3}$; 8 by $\frac{1}{4}$; 16 by $\frac{1}{5}$.

3. Divide 5 by $\frac{1}{4}$.

Solution: (a) $5 \div \frac{1}{4} = 20$.
(b) $5 \div \frac{1}{4} = \frac{1}{4}$ of 20 = $6\frac{3}{4}$. ($\frac{1}{4}$ is contained in any number $\frac{1}{4}$ as often as $\frac{1}{4}$ is, because it is 3 times as large.)

or:

(a) $5 \div 1 = 5$.

(b) $5 \div \frac{1}{4} = 4 \times 5$. ($\frac{1}{4}$ is contained in any number 4 times as often as 1 is.)

(c) $5 \div \frac{1}{4} = \frac{1}{4}$ of $4 \times 5 = 20 = 6\frac{3}{4}$.

4. $8 \div \frac{1}{2}$ = what?

Solution: $8 \div 1 = 8$.

$8 \div \frac{1}{2} = 5 \times 8$. (why?)

$8 \div \frac{1}{2} = \frac{1}{2}$ of $5 \times 8 = \frac{5}{2} \times 8 = 10$.

Answer: $\frac{1}{2}$ is contained in 8 ten times.

Proof: $10 \times \frac{1}{2} = 8$.

5. $9 \div \frac{1}{6}$ = what?

Solution: $9 \div \frac{1}{6} = 6 \times 9 = 54$. ($\frac{1}{6}$ is contained in any number 6 times as often as 1 is.)

6. $9 \div \frac{2}{3}$ = what?

Solution: (a) $9 \div \frac{2}{3} = 6 \times 9$.

(b) $9 \div \frac{2}{3} = \frac{1}{2}$ of $6 \times 9 = \frac{1}{2}$ of $9 = \frac{9}{2} = 4\frac{1}{2}$. ($\frac{2}{3}$ is contained in any number $\frac{1}{2}$ as often as $\frac{1}{2}$ is.)

7. $\frac{3}{4} \div \frac{1}{2}$ = what?

Solution: $\frac{3}{4} \div \frac{1}{2} = 3 \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$. ($\frac{1}{2}$ is contained in any fraction or number 2 times as often as 1 is. 1 is contained in $\frac{3}{4}$, 3 times as often as 1 is. $\frac{1}{2}$ is contained in $\frac{3}{4}$, 3 times as often as 1 is, so $\frac{1}{2}$ is contained in $\frac{3}{4}$, 3 times as often as 1 is.)

8. $\frac{3}{4} \div \frac{2}{3}$ = what?

Solution: $\frac{3}{4} \div \frac{2}{3} = \frac{3}{4} \times \frac{3}{2} = \frac{9}{8} = 1\frac{1}{8}$ (because $\frac{2}{3}$ is contained $\frac{3}{2}$ as often as $\frac{1}{2}$).

9. $6\frac{3}{4} \div 2\frac{1}{4}$ = what?

Solution: $6\frac{3}{4} \div 2\frac{1}{4} = \frac{27}{4} \div \frac{5}{4} = \frac{27}{4} \times \frac{4}{5} = \frac{27}{5} = 5\frac{2}{5}$.

Thus we see that division of fractions is accomplished by inverting the divisor and multiplying.

Adding Mixed Numbers

In adding mixed numbers, expand the fractions to a common denominator, add them, then add the sum of the fractions to the sum of the integers.

Example: $12\frac{2}{3} + 21\frac{1}{4} + 8\frac{1}{2}$.

| Form in Full | Short Form |
|-----------------------------------------------------|----------------------------------|
| $12\frac{2}{3} = 12\frac{8}{12}$ | $12\frac{8}{12}$ |
| $21\frac{1}{4} = 21\frac{3}{12}$ | $21\frac{3}{12}$ |
| $8\frac{1}{2} = 8\frac{6}{12}$ | $8\frac{6}{12}$ |
| $41\frac{2}{3} = 41 + 1\frac{1}{3} = 42\frac{1}{3}$ | $42\frac{1}{3} = 42\frac{4}{12}$ |

Subtracting Mixed Numbers

Example: $24\frac{1}{2} - 10\frac{3}{4}$.

| | |
|-----------------|------------------------------------------------|
| $24\frac{1}{2}$ | |
| $10\frac{3}{4}$ | |
| $13\frac{1}{4}$ | (add $\frac{1}{4}$ to make the subtrahend 11). |
| $13\frac{1}{4}$ | (add 13 to make the subtrahend 24). |
| $13\frac{1}{4}$ | (add $\frac{1}{4}$ to make the subtrahend 24). |
| $13\frac{1}{4}$ | total added. |

Multiplying Mixed Numbers

To multiply a mixed number by an integer or an integer by a mixed number, add the product of the integer and fraction to the product of the two integers.

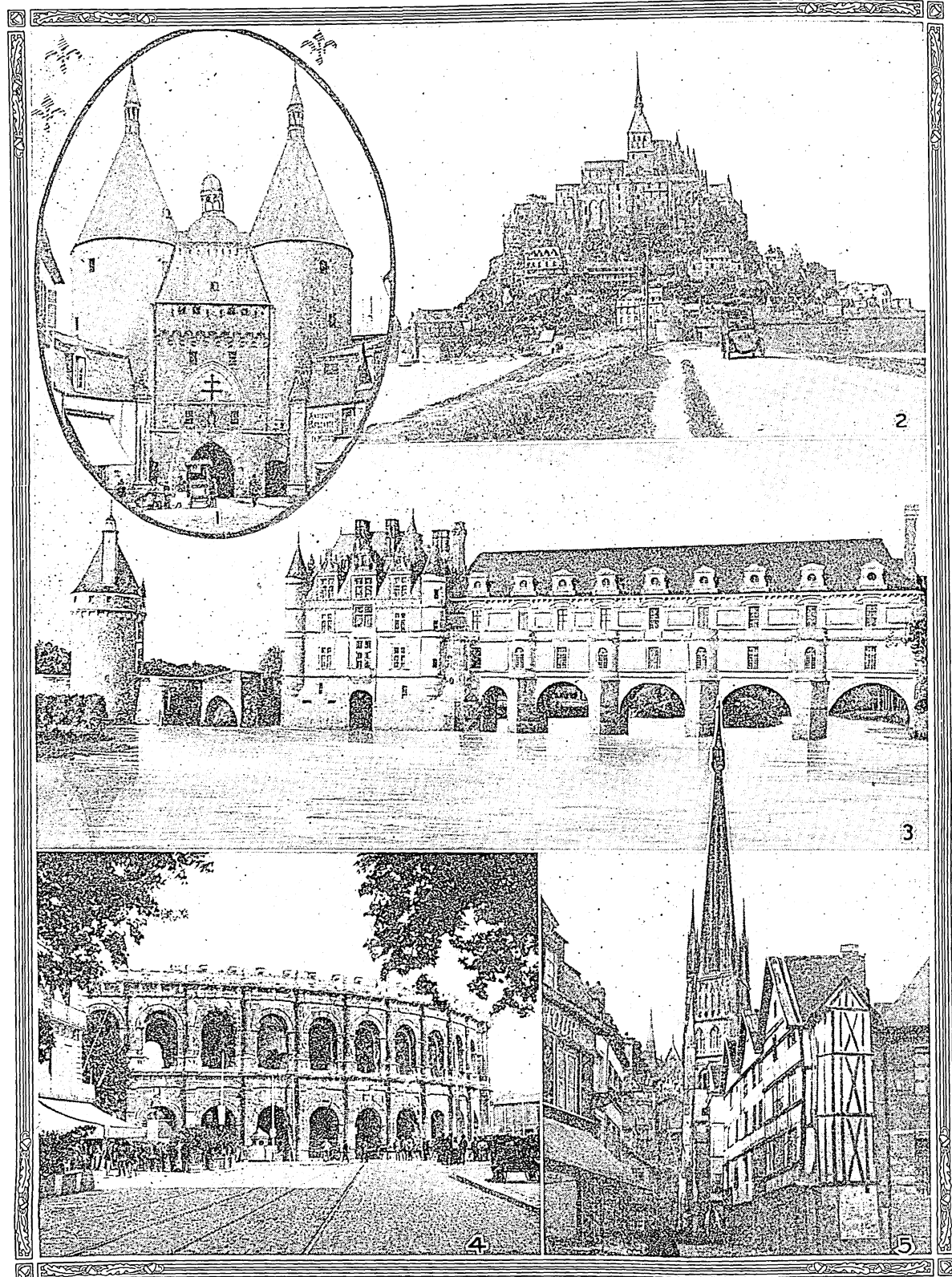
Example: $32 \times 2\frac{1}{2}$.

$$\frac{1}{2} \times 32 = \frac{32}{2} = 16$$

$$2 \times 32 = 64$$

$$16 + 64 = 80$$

HISTORIC SPOTS IN PICTURESQUE FRANCE



1. One of the seven noted gates of the city of Nancy. 2. Mont Saint-Michel, a curious town crowned by an ancient abbey-fortress on a rocky islet off the northern coast of France. 3. Château of Chenonceaux with its gallery built astride the Cher River. 4. Ruins of the old Roman arena in Nîmes. 5. View of an old street in Strasbourg.

"A NAME *that* RINGS *Like a* BATTLE-SONG"

FRANCE. The geographical position of France, as well as her stirring history, have fitted her for an important rôle in world affairs. Situated at the cross-roads of western Europe, France is the least isolated of the great nations. She faces in every direction and has no "back door." To the north, her close neighbor is Great Britain; to the east, Belgium, Germany, Switzerland lie at her gates; to the south, Italy and Spain; a bare day's sail separates her from Africa; and the sea route to the Balkans, the near East, and the Suez Canal passes by her southern shores.

Bordering at once on the Mediterranean, the Atlantic, the English Channel, and the edge of the North Sea, France belongs equally to southern and northern Europe—to the old era and to the new. When Rome was the center of the civilized world, Gaul—as France was then called—was a notable part of her Empire; and when medieval Venice and Genoa controlled the world's commerce, the French were close at hand to play their part. Then, when the scene of power shifted from south to north through the discoveries in the New World, along the African coast, and in the far Pacific, turning men's eyes away from the "middle sea," France retained the importance which was lost by other Mediterranean lands.

It is only natural that, in a region so open to the world, we should find a varied racial mixture. Traces of several important prehistoric races abound in France (*see* Cave Dwellers); but at the dawn of recorded history most of France was inhabited by the Gauls, a people of Celtic blood. In the southeast,

Extent.—North to south, about 600 miles; east to west, 400 to 570 miles. Coast-line: English channel, 672 miles; Atlantic, 831 miles; Mediterranean, 369 miles. Area (including Corsica and Alsace-Lorraine), 212,659 square miles. Population, about 42,000,000. **Natural Features.**—Alps (Mont Blanc, 15,782 feet), Pyrenees, Jura, and Vosges mountains. Rhone, Garonne, Loire, Seine, Somme, Meuse, and Moselle rivers; the Rhine now forms part of the eastern boundary. Climate, temperate; semi-tropical on south coast. **Products.**—Textiles (cotton, woolen, linen, silk), laces, clothing, objects of art and fashion; coal, machinery, iron and steel, porcelain, glass, and chemicals; wines and cider; grains, potatoes, sugar, etc. **Principal Cities.**—Paris (capital, about 2,830,000 population); Marseilles, Lyons (more than 500,000); Bordeaux, Nice, Toulouse, Lille (more than 200,000); Nantes, Strasbourg, St. Etienne, Le Havre, Toulon, Rouen, Nancy, Reims, Roubaix, Clermont-Ferrand (more than 100,000). **Colonies.**—In Asia, Indo-China; in Africa, Algeria, Tunisia, Morocco Protectorate, French Equatorial Africa, Madagascar, etc.; in America, French Guiana, Martinique, Guadeloupe; islands in the Pacific (New Caledonia, Tahiti, Marquesas, etc.). Area (including mandates), about 4,500,000 square miles; population, about 62,000,000.

600 B.C. Greek traders founded the colony of Massalia (modern Marseilles), and rapidly extended their commerce far into the interior.

however, lived the Ligurians, of the same race as the ancient dwellers in northern Italy; and in the southwest the Iberians, probably survivors of a widespread race who had inhabited western Europe before the coming of the Celts.

Phoenician merchants settled at a very early date on the Mediterranean coast; and about

Then, in the succeeding centuries, came the Roman conquerors, under whom Gaul became thoroughly Romanized. The invasion of the Germanic tribes followed—the Visigoths, the Burgundians, and the Franks, the latter giving the land their own name and supplying a dominant influence which was never overthrown. Moors or Saracens from Spain settled for a time north of the Pyrenees and exercised a fleeting rule; and fair-haired Northmen from Scandinavia made their homes along the English Channel and became in time the Normans.

All these later settlers were more or less absorbed by the original Gallo-Roman population, but some of them worked profound changes in the customs and physical appearance of the native inhabitants. To these influences must be added those arising from the later immigrations of

Italians, Spaniards, Germans, Dutch, and other nationalities and peoples, reflected in nearly any list of representative French names.

France, which is only about four-fifths as big as the state of Texas, presents to this day marked differences in the types of her people. In Normandy, for

QUIET DOMESTIC LIFE IN BRITTANY



Primitive ways prevail in Brittany, where the gossiping afternoon hours are spent in spinning, wool-winding, or embroidering the crisp white caps worn by the women. Each district has its cap, but in all parts of Brittany the women, even in summer, wear thick black serge, with stiff silk or velvet sleeves. Wooden shoes, too, padded with a bit of cloth or straw, are the daily footwear of the peasants.

instance, we find the tall, blue-eyed, light-haired descendants of the viking Northmen. In the southern provinces—Gascony, Languedoc, and Provence—the short dark-haired pre-Celtic type prevails. In Brittany we have people of purest Celtic descent, still speaking a Celtic tongue; while on the north slopes of the Pyrenees live descendants of the ancient Iberians, called the Basques, who have kept alive a language whose origin is largely a mystery.

But All are Devoted to France

But despite these reminders of a varied origin, the people of France are bound together by strong national ties and a devotion to a common heritage. The Gallic "melting pot" has fused the diverse elements. The glories and disasters of a stirring and eventful history have welded and forged and tempered them into a nation whose power and vitality have more than once astonished the world.

One of the most frequently remarked characteristics of the French people is hard-headed thrift, typified by the peasant land-owner. "Jacques Bonhomme" ("Goodman Jacques"), as he is called, is the backbone of the nation, and he is so strongly attached to the soil of his forefathers that his kind has never followed the example of other Europeans in emigrating in considerable numbers to foreign lands.

France is shaped roughly like a pentagon or five-sided figure. Its apex lies just beyond Calais on the North Sea; the Pyrenees Mountains and the Mediterranean make up the base; the Atlantic and the English Channel form the western and northwestern sides; and Belgium, Luxemburg, and part of Germany, and Switzerland and Italy, the northeastern and eastern sides respectively. The greatest length north to south is about 600 miles; the greatest width about 570 miles. The island of Corsica, which lies more than 100 miles from the mainland coast in the Mediterranean, is an integral part of France (see Corsica); and for most purposes Algeria, a night's sail across that sea, in Africa, is also treated as an equal part of the republic and not as a colony (see Algeria).

The western coast line of France shows two pronounced land projections—the Norman peninsula (called "Cotentin"), which reaches out into the English Channel, with Cherbourg in its head; and the rock-bound peninsula of Brittany, with the thriving maritime city of Brest near its westernmost point. In the angles between the Norman and the Breton peninsulas lie the Channel Islands—Jersey, Guernsey, Alderney, and Sark—still ruled by the English crown, though the rest of Normandy has long since been lost to it.

The broad sweeping curve of coast between Brittany and Spain is known to us as the Bay of Biscay, though the French usually call its lower angle the Gulf of Gascony. The deep depression in the coast of Languedoc, on the Mediterranean, is called the Gulf of the Lion.

Why France is Lacking in Harbors

The seacoasts of France are usually either dangerously rocky, or low and sandy, so that there are comparatively few good harbors aside from the mouths of rivers. Of these river ports the most important are Le Havre

and Rouen on the Seine, St. Nazaire and Nantes on the Loire, and Bordeaux on the Garonne. The Rhone, owing to the great quantities of sediment carried down by its rapid current and the low swampy character of the delta at its branching mouth, offers no good harbor facilities. The principal seaports which are not situated on rivers are Marseilles, the largest of all; Cherbourg, guarded by a huge breakwater and an important naval station; Boulogne, Dunkirk, and Calais, in the extreme north; La Rochelle on the west coast; and Cette on the Gulf of the Lion opposite Marseilles. Brest in Brittany and Toulon on the Mediterranean are important naval stations but they have comparatively little general commerce.

It is mostly a smiling and fertile land that the French have inherited from their ancestors. A line drawn from Bayonne in the southwest to the wooded hills of Ardennes on the northeast border roughly

THE NAME OF FRANCE

*Give us a name to fill the mind
With the shining thoughts that lead mankind,
The glory of learning, the joy of art,
A name that tells of a splendid part
In the long, long toil and the strenuous fight
Of the human race to win its way
From the ancient darkness into the day
Of freedom, brotherhood, equal right—
A name like a star, a name of light,
I give you France!*

*Give us a name to stir the blood
With a warmer glow and a swifter flood
At the touch of courage that conquers feud—
A name like the call of a trumpet, clear
And silver-sweet and iron-strong,
That brings three million men to their feet
Ready to march and ready to meet
The foe who threatened that name with wrong—
A name that rings like a battle-song,
I give you France!*

*Give us a name to move the heart
With the strength that noble griefs impart—
A name that speaks of the blood outpoured
To save mankind from the sway of the sword—
A name that calls the world to share
The burden of sacrificial strife
Where the cause at stake is the world's free life
And the rule of the people everywhere—
A name like a vow, a name like a prayer,
I give you France!*

—Henry van Dyke.

divides the rolling plains of western France—less than 600 feet high—from the highlands of the east. In the midst of the highland section lies the confused mass of the Auvergne Mountains, with summits rising to 6,000 feet and hundreds of extinct volcanoes. Adjoining them to the southeast lies the chain of the Cévennes, extending some 200 miles, from the foot-hills of the Pyrenees to beyond Lyons. To the east separating Alsace from the rest of France are the forest-clad Vosges. Along the border of Switzerland rise the more important Jura Mountains (*see* Jura Mountains); and from Switzerland to the sea, along the whole Italian frontier, stand the mighty peaks of the Alps. The summit of Mont Blanc (15,782 feet), which lies seven miles inside the French boundary, is the second highest peak in Europe, being surpassed only by Elbrus peak in the Russian Caucasus. In Brittany and Normandy are minor groups of hills and mountains, some of them exceedingly rugged, but of no great height. North of the River Loire in what is called the "Paris basin" the successive low elevations have a uniformly gentle slope toward the west, but toward the east they present abrupt faces. This striking peculiarity, which renders difficult military invasions of France from the east, explains why Germany broke her plighted word, in 1914 and again in 1940, and violated Belgium's neutrality in order to find an easier and quicker way into the French republic.

Four great river systems—the Rhone, the Garonne, the Loire, and the Seine—each with numerous tributaries, drain the well-watered soil of France. The Rhone, which carries the greatest volume of water, rises in Switzerland, flows into Lake Geneva, then out again, and enters France through the gap between the Jura and the Alps. At Lyons it picks up the waters of its great tributary, the Saone, and is turned sharply to the south by the bluffs of the Cévennes Mountains. The Rhone valley from this point to the Mediterranean coast is one of the most picturesque parts of France, but the lower river is scarcely navigable on account of the swiftness of its current and shifting channel (*see* Rhone River).

The Garonne River in the southwest gathers its waters about equally from the Pyrenees and the western slope of the Cévennes. After uniting with the Dordogne near the Atlantic coast, it forms the broad estuary called the Gironde. The Loire, the longest of French rivers, also rises in the Cévennes, southwest of Lyons. Crossing the whole breadth of central France and gathering numerous tributaries, it pours into the Atlantic south of the peninsula of Brittany (*see* Loire River).

In northern France the Seine, after collecting the waters of the Paris basin, winds sluggishly across the Norman plain and empties into the English Channel at Le Havre (*see* Seine River). On its chief tributary the Marne, and on the Aisne, which flows into the Oise, another tributary, great battles have been fought (*see* Aisne River; Marne River).



Nothing could be more typical of the soaring French genius than the majestic Eiffel Tower in Paris. It was designed and erected by the famous French engineer, Alexandre Gustave Eiffel, for the Paris Exposition of 1889, and with its height of 984 feet it long enjoyed the distinction of being the world's tallest structure. After the Exposition, the French preserved it, as a fitting example of how the nation's designers combine good taste and artistry in all their engineering works. It still stands as a monument to engineering skill, an observation tower for sightseers, and an important government station for wireless telegraphy and meteorological observations. Sightseers are carried by elevators as high as the third platform from the ground. From there on clear days they can view the countryside around Paris to a distance of 85 miles.

In addition to these four river systems, several other streams need mention. The little river Somme, which parallels the Seine 50 miles to the north, has been famous in history since the campaign which led to the battle of Crécy in 1346. The Meuse and the Moselle rivers, which rise in north-eastern France, follow most of their course in Belgium and Germany, respectively. The Rhine, forming part of the eastern boundary, is partially a French river.

All these streams are more or less navigable; and connecting as they do with a great network of canals, they form a system of waterways extremely valuable to French industry and commerce. One of the most famous of French canals is the Canal du Midi, dating from the reign of Louis XIV, which connects the Mediterranean with the Garonne River and so with the Atlantic. There are others that join the Rhone, the Loire, the Seine, and the Rhine systems one to the other, so that heavy freight can be carried entirely by boat to and from every important industrial region. The Rhone-Marseilles Canal links the Rhone with Marseilles on the Mediterranean. At Rove, the canal flows under the hills of la Nerthe through the Rove Tunnel, about $4\frac{1}{2}$ miles long, 72 feet wide, and 50 feet high. This tunnel can accommodate the heaviest barges which carry raw material from Marseilles to inland factories.

Farming Is Chief Industry

The greatest industry of France is agriculture. The winds from the Atlantic, unchecked by coastal mountain ranges, carry abundant moisture to practically the whole land, and this produces a climate favorable to a wide variety of crops. Only in the extreme southwest is there much unproductive soil.

Farming has followed closely the changes in salability of farm products. After the middle of the 19th century, meat production and dairying increased, as cheap imported wheat kept wheat prices down. Im-

port restrictions, tariffs, and bureaus for control of production and marketing of wheat, set up in the decade following the World War of 1914-1918, caused such a great increase in production that France changed

from a wheat-importing to a wheat-exporting country. Oats rank next to wheat, and rye and barley are raised on the poorer soils of the coast and of the eastern mountain regions. Sugar beets, growing on the rich northern plains, provide the raw material for hundreds of sugar factories and refineries. Hops, flax, and hemp are also raised. Fruits and vegetables are of excellent quality, and all districts have their truck gardens. Among vegetables, potatoes take first rank, as might be expected in the land where the scientist Parmentier first popularized the potato as food by inducing King Louis XVI to wear the flower of the plant in his buttonhole. A coarse tobacco is grown in scattered regions. Its cultivation, manufacture, and sale is a government monopoly yielding a large revenue.

The Land of Wine

More wine is produced in France than in any other country. The mild cheap red or white varieties replace largely the tea and coffee of other nations. The wines of the provinces of Champagne and Burgundy, the regions about Bordeaux, the valleys of the Loire, the Rhine, and the Rhone, and the hills of Languedoc in the south are famous the world over. Wines constitute an important export, but so much of the cheaper grades is consumed at home that great quantities are imported also, especially from Algeria. Cider is produced in Brittany and Normandy.

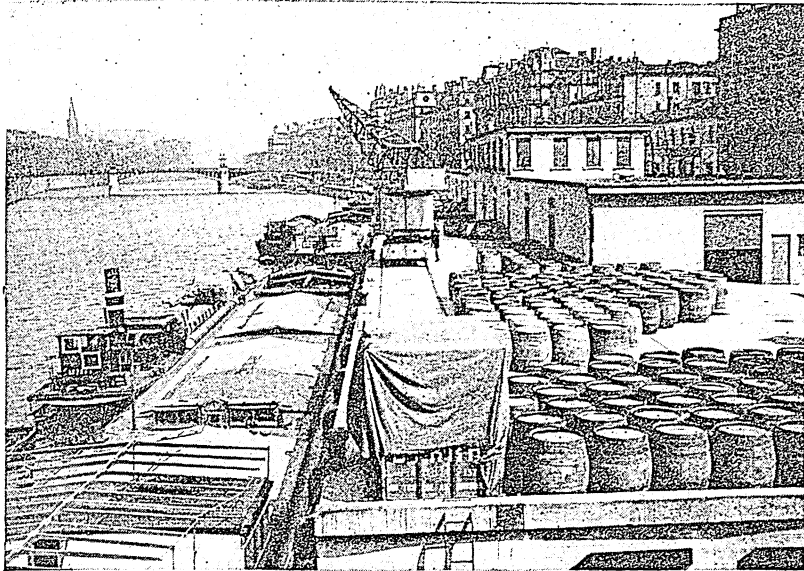
The balance of French foreign trade after the war was greatly influenced by the development of the French colonies, and by the large imports from Germany constituting "reparations in kind" (see World War of 1914-1918). Important imports include wool, cotton, coal, machinery,

TO THE MAID OF ORLEANS



On the exact spot where Joan of Arc was burned at the stake in May 1431 this memorial, in the modern style, has been placed. It stands in the market place of Rouen, not far from the famous Rouen cathedral.

LYON AND ITS BUSY RIVER TRAFFIC



Much of the bulky freight of France is carried by barges on the extensive system of rivers and canals. Here we see a cargo of wine on a wharf at Lyon being loaded for transportation on the Saône River. The Saône is connected with the Rhine by canals.

wines, coffee, petroleum, and copper. Leading exports are fabrics of cotton, wool, silk, and rayon; machinery; iron and steel; chemicals; women's clothing and lingerie; automobiles, and metal manufactures. France ranks second in automobile production, although its output is small compared with that of the United States. Fine, hand-made cars are a specialty.

France Breeds Famous Horses

The meadows of the great French plain produce quantities of beef and dairy cattle; and the northern provinces are the homes of famous breeds of draft horses—Breton, Norman, Percheron, and Flemish. The slopes of the Pyrenees are noted for their mules; hogs thrive everywhere; sheep and goats are raised in great numbers on the high pasture lands of the Cévennes, the Vosges, and the Jura; and vast quantities of poultry and eggs are marketed in all sections.

Live stock production increased steadily from 1900 to 1913, but during the World War stocks were greatly depleted, and were only slowly brought back to pre-war figures. Beef and veal were the first to regain their former levels. Mutton production lagged behind. Another effect of the World War was to increase the demand for meat in urban and industrial centers.

Since the French Revolution the land has been divided among a great many small owners, and the laws of inheritance and the custom of the people tend to perpetuate these small holdings. It is this peasant ownership of the soil which promotes thrift, hard work, and intensive cultivation on the one hand, and on the other that "attachment to the soil" and spirit of independence which comes to the farmer who "works for himself." Socialism, long popular in French industrial centers, invariably meets an insurmountable obstacle in the French farmer's desire to cling to

private ownership of his land. Though a strong follower of tradition, he is primarily an individualist who wants to be allowed to manage his own affairs in his own way.

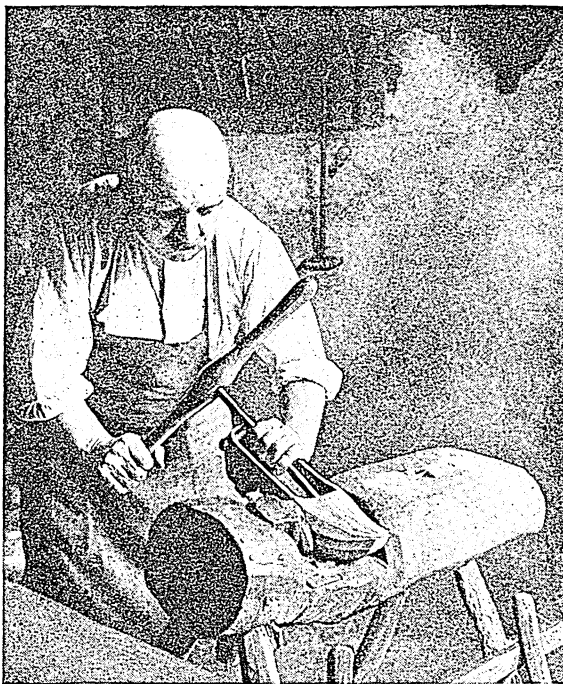
Fisheries Add to Nation's Wealth

France ranks high among fishing countries. The north coast provinces send large fleets each year to the haunts of the cod in the waters of Newfoundland and Iceland, and to the herring schools of the North Sea. On the west coast oysters and sardines are taken; and in the Mediterranean, sardines, anchovies, and tunny.

The forest and lumber industry of France has been developed to a very high degree, but local production is far from sufficient to meet the demands of the wood-consuming industries.

Some lumber is exported, but large quantities of softwoods must be imported, too, each year from northern Europe and America, together with rarer woods from the tropics for manufacturing certain kinds of furniture. The quarries of the highlands produce plenty of stone for construction work, particularly

THE VILLAGE SHOEMAKER



This workman is making a sabot, one of the wooden shoes the French peasants have worn for centuries. Each sabot is cut from one piece of wood; styles vary with the community.

granite. The typical French farmhouse is built of stone with a thatched roof, the barn also of stone, and most of the old land boundaries are low stone walls.

Iron and Coal—Sinews of Heavy Industry

In the development of large-scale manufactures of iron and steel, France lagged behind its neighbors.

A DAUGHTER OF FRANCE



Long skirts are not so fashionable in France as this girl's costume indicates. She lives in Arles, and wears this old Arlesian attire only at such times as "the great fête of Arles" around the first of July.

It was rich in iron, but poor in coal. The chief deposits of these minerals were in the north-east, where France borders Belgium and Germany in the most heavily industrialized section of Europe. In the World War of 1914-18, France won back Alsace-Lorraine, with its valuable mineral resources, from the German Reich (see Alsace-Lorraine). The addition of these provinces made the country for a time a leading producer of iron and steel. France's coal supply was also supplemented with the produce of Germany's coal fields in the Saar basin—until 1935, when the League of Nations returned the district to Germany.

Under the impetus of its victory in 1914-18, France

made rapid strides in industrial production. It came to rank among the foremost industrial nations of the world. Automobiles, machinery, iron and steel, chemical products, and textile goods were produced in great volume in the mills and factories of Lille, Lyons, Nancy, Le Creusot, St. Etienne, and the Paris region. An abrupt halt came in 1940, when German conquest of France brought economic disaster.

Where Industries are Fine Arts

The textile industries of France are famous the world over. The Lyons silk trade, once the greatest in all Europe, is still important. Normandy, and particularly the city of Rouen, is noted for its cotton cloth, two-thirds of the raw cotton being imported from the United States through Le Havre. Woolens, which rank high among French exports, are mostly manufactured in the region from Lille to Reims. Linens are made in Lille, Roubaix, and other northern

towns. The laces of Normandy and Brittany, notably the hand-worked lace of Alençon (point d'Alençon), bring high prices on both sides of the Atlantic.

France is distinguished also for her fine leather goods, the exquisite porcelains of Sèvres and Limoges, the cut glass of Baccarat, the jewelry made chiefly in Paris and its environs, the perfumes distilled from the flowers of her sunny Mediterranean border, and countless other articles of art and fashion. In general, French factories are remarkable rather for the good taste and fine quality of their goods than for quantity of production; and vast establishments with up-to-date machinery are the exception.

More than in any other great nation perhaps, the life of France centers in its capital. Paris is the actual heart of the nation's commerce and industry, of its social and political affairs. The wonderful system of French roads, built up and extended from the famous old Roman roads, centers upon Paris. All the great railway lines, airways, and waterways meet there, making a vast web that connects every part of France with the capital. Frenchmen who wish to play a leading part in the affairs of the nation must go to Paris. And although Paris life as seen by the tourist by no means reflects the true life of the French, it is there that political, literary, and artistic history is made.

A FINE DAY'S "CATCH"

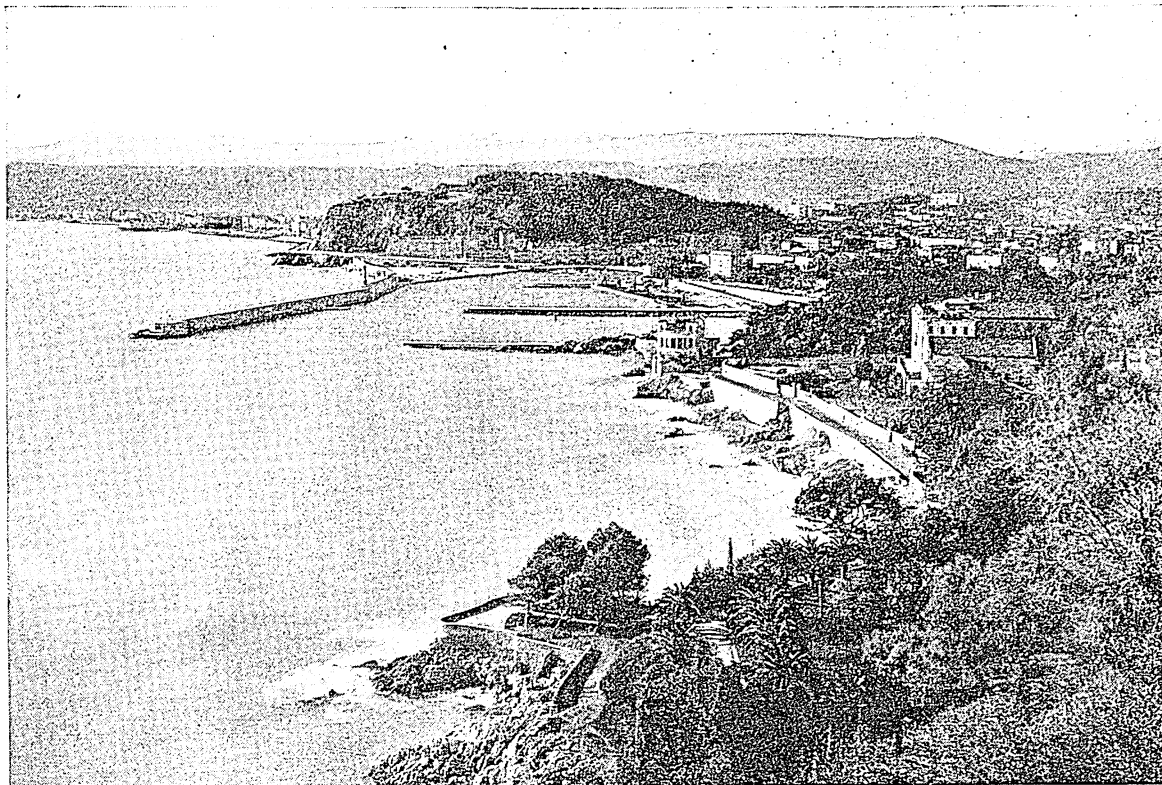


The greatest asset of France is the sturdy industrious character of her people. Here is a French fisherman with his "catch" on his back and his trusty fish spear. His whole appearance tells of thrifty independence.

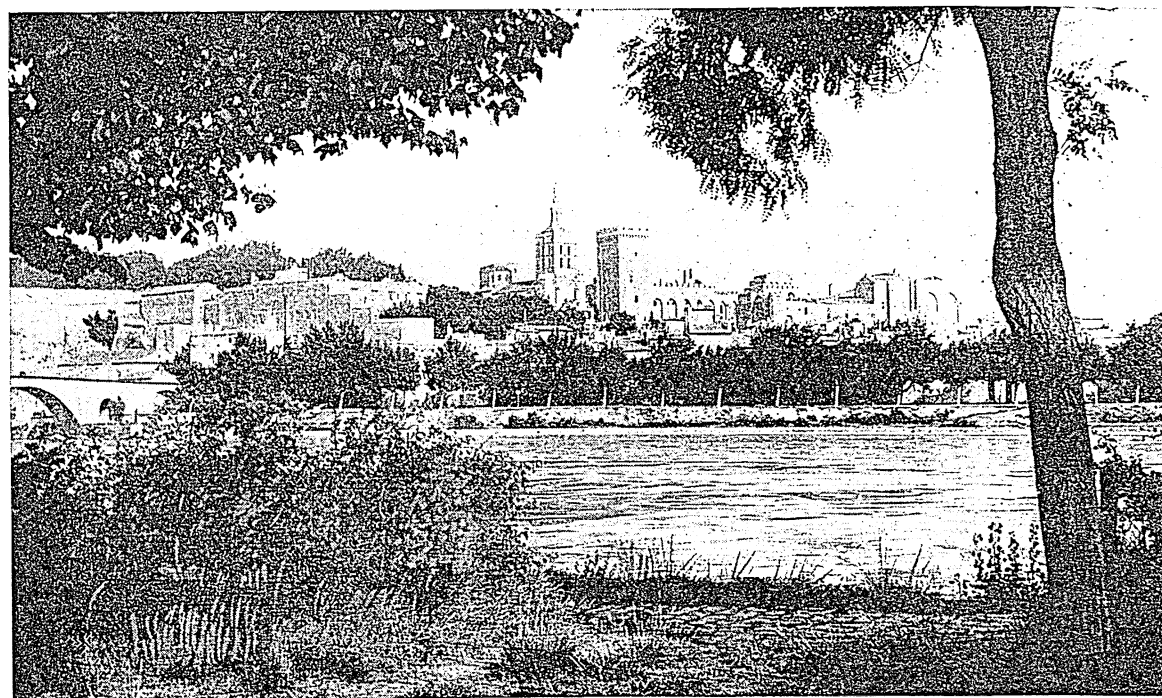
So strong is the intellectual and artistic influence of Paris that it extends far beyond the borders of France, so that it has been called the "modern Athens" and the "intellectual capital of the world" (see Paris).

It has been said that every man has two countries, "his own and France." This suggests truly the charm

TWO CHARMING BITS OF SOUTHERN FRANCE



The whole coast of the Mediterranean from Cannes to the Italian frontier is a fairyland of beauty known as the French Riviera. It stretches for miles, with famous resorts, quaint villages, and vistas of great beauty. This view of the famed city, Nice, expresses some of the charm of this part of France. The hill in the center is the "Château," the original village site.



The Palace of the Popes in Avignon on the Rhone is one of the famous historic structures of southern France. It was built between 1316 and 1370 during the period when the papal seat was at Avignon.

that foreign visitors find in this smiling land. The most striking thing is the evidence found everywhere of France's stirring history. Perhaps it is an old walled city such as Carcassonne, whose stone towers and battlements still stand much as they were in the far-off Middle Ages. Perhaps it is the marvelous triple-arched Roman aqueduct, flung across a river valley near Nîmes 18 centuries ago and still standing in its majestic simplicity. Or it may be the twin spires of William the Conqueror's famous Abbey church at Caen in Normandy, or the queer crooked streets of Rouen and the ancient houses that once looked down upon the procession which bore Joan of Arc to the stake. Those who have seen the great Gothic churches which, like gigantic carved jewels, dot the surface of northern France—at Amiens, Chartres, Le Mans, Reims, Paris, etc.—can never forget their soaring grandeur. And those who have visited the famous châteaux of France—Chinon, Loches, Amboise, Chambord, Chenonceaux, Azay-le-Rideau in Touraine, and the ruins of Coucy, Gaillard, and Pierfonds elsewhere—have read some of the most stirring pages of French history in letters of stone.

But the list is endless; almost every town and village has its own romantic or tragic memories of the past. Besides these great monuments of the past, France possesses in the Palace of the Louvre in Paris, and elsewhere, some of the rarest museum collections in the world—immortal paintings and statues, rare

Everywhere the tourist and the student find inspiring associations and reminders of the great men and women who shaped the destiny of France and who influenced the entire world of science, literature, art, music, and politics.

"JACQUES BONHOMME" AT HIS WORK



France rightfully regards her farmers as the very foundation of the nation. Their industry and thrift underlie the prosperity of the entire country.

France is a vast nation. Not only is it the third largest country in Europe, but its numerous colonies and mandated territories, scattered over the face of the globe, make up an empire second only to Great Britain's. These dependencies cover an area of about 4,500,000 square miles, with a population of about 62,000,000. The war with Germany in 1870 left France defeated and humiliated, and from that time on French energies were directed toward building up a colonial empire.

France then had only a sprinkling of colonies, including unruly Algeria, a few cities on the coast of India, some trading stations on the coast of Africa (Senegal, Somaliland, and others), various islands (Reunion, New Caledonia, Tahiti, Guadeloupe, Martinique, Miquelon, and St. Pierre) and a mere foothold in Cochin China. As other European powers acquired outlying territory, France, not to be outdone, pushed its way in near by. Finally by the close of the 19th century France had established a definite colonial policy and amassed a vast empire.

Millions were spent by the government after the World War of 1914-1918 in developing the colonies and mandates. Great irrigation projects were begun. Air lines were established; railroads and highways were built; and natural resources were exploited. France earned

a reputation for efficient, intelligent administration of its vast colonial empire.

The Government of France

Until its conquest by Germany in 1940 and its adoption of a new semi-totalitarian form of government

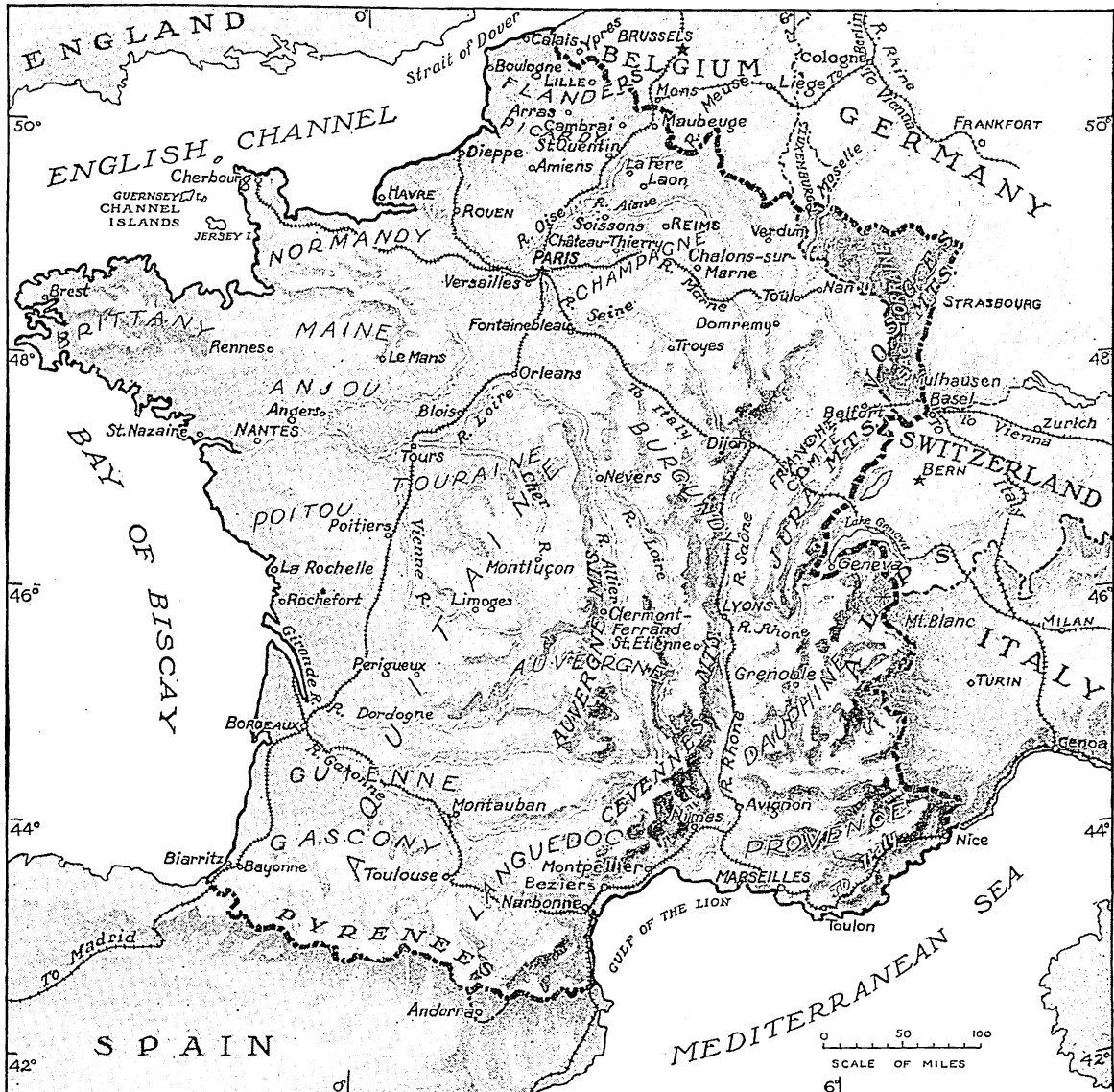
IN FRANCE'S FAMOUS VINEYARDS



Growing grapes for the manufacture of wine is one of the leading industries in France. The supremacy of the French vineyards depends largely upon the patience and skill with which they are cultivated.

documents, remains of prehistoric peoples gathered from the caves of the southern provinces, an endless array of priceless memorials which attract each year students of art, of history, and of science by thousands from all parts of the civilized globe.

THE QUEEN OF THE THREE SEAS



One of the reasons for the greatness of France is that her coasts command three great seas—the Mediterranean, the Atlantic, and the North Sea, at the Strait of Dover. Instead of the names of the 90 “departments” into which France has been divided since 1791, this map gives the names of the old “provinces” which have been made famous through centuries of history, and which are still in popular use. Note, too, how four rivers—the Somme, Loire, Gironde, and Rhone—drain much of the country.

France was a republic, with power vested ultimately in parliament. Administration was conducted through 90 regional departments, each of which elected a number of deputies by popular vote for a four-year term. These formed the Chamber of Deputies. The Senate was composed of 315 members elected for nine years by an electoral college. The president was elected by parliament for a seven-year term. Executive power rested with the premier, or president of the Council of Ministers, who was selected by the president from the dominant political party. The premier, in turn, chose his cabinet, usually from the Chamber of Deputies or the Senate. An adverse vote in the Chamber on any

important government policy meant that the cabinet had to resign, whereupon an outstanding member of the opposition formed a new ministry.

The central government named the “prefects” of all departments, who controlled the locally elected municipal councils, the mayors, and other local officials. The government was thus completely centralized. Although the majority of the people are Roman Catholics, no religion is recognized by the state.

Primary education is free and compulsory for children between the ages of six and thirteen. The public schools, divided into three classes—primary, secondary, and superior—constitute the University of France.

Growth of France through 2,000 Years

AT the time of the Roman Conquest France was occupied by a large number of independent tribes, who were of "Mediterranean" stock (*see* Races of Mankind) and spoke various dialects of a Celtic tongue. The Romans found the conquest of these tribes no easy matter, but Julius Caesar finally overcame them and organized Roman government (58-51 B.C.). The Gauls, as the Romans called these natives, adopted the Roman dress, language, and customs. Christianity spread from Rome to Gaul and was widely accepted as early as the 4th century.

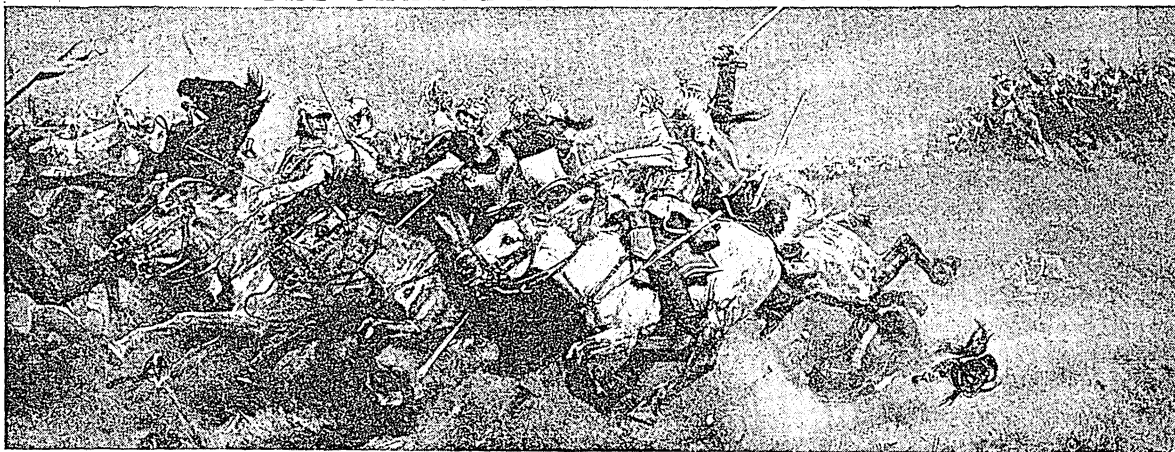
With the decline of the Roman Empire, German barbarian invaders entered Gaul. Chief among these were the Franks, who under Clovis (481-511) established Frankish rule over most of that land. His adoption of Christianity led to the conversion of all those who served him.

The Merovingian dynasty, of which Clovis was the founder, was thrust aside by a new family—the Carolingians—who had been the "Mayors of the Palace" and now gave new life to the declining Frankish state. The greatest ruler of this line was Charlemagne, whose reign belongs to world history. He became the supporter of the Christian church and was crowned Emperor of the Holy Roman Empire by the Pope in Rome on Christmas Day, 800 (*see* Charlemagne).

state when the Hundred Years' War with England (1337-1453) impoverished her and led to conditions approaching anarchy in many parts of the country. A French peasant girl, Joan of Arc, became the national heroine by turning the tide against the English, who were finally driven from the soil of France (*see* Hundred Years' War). France slowly recovered, and her kings—chiefly Louis XI (1461-83)—gradually were able to unify the nation and to centralize government in their own hands. Louis XIV (1643-1714) marked the culmination of the power of the sovereign. He was indeed "the state." His authority was envied by the sovereigns of Europe and his court was imitated (*see* Louis, Kings of France). Meanwhile Protestant (Huguenot) ideas spread in France in the time of Francis I (1515-47), and civil wars over religion followed which occupied the latter part of the 16th century. Though France had rejected Protestantism, partial toleration was granted by gallant Henry IV (1589-1610) in the Edict of Nantes (1598).

The 18th century witnessed a long struggle between England and France for colonial empire. The Treaty of Paris (1763) marked the loss by France both of her great dominions in America and her ascendancy in India. This loss, together with internal inefficiency and abuses of administration, brought upon the

THE CHARGE OF THE CUIRASSIERS



This painting by A. Morot represents a scene typical of the Franco-Prussian War. It took place at Rezonville, near Metz August 16, 1870. The French Imperial Guard was ordered to charge in the face of withering fire. To obey meant death, yet they rode forward at full gallop, crumpling the Prussian cavalry, only to be mowed down in turn by the German guns and rifle fire.

Charlemagne's empire after his death fell into three parts, the western part becoming the kingdom of France. But the word "kingdom" meant little, for the spread of the feudal system distributed the power of government among local rulers and left to the king little but nominal overlordship. Under the Capetian kings, of whom Hugh Capet was the first (987), this system—or rather lack of system—reached its height. (*See* Feudalism.)

Some progress was made under Philip Augustus (1180-1223), Louis IX (1226-70), and Philip IV (1285-1314). But France was still in a disorganized

government much criticism. An educated middle class was growing up who were dissatisfied with the "old régime" and demanded an influence in the government proportionate to their wealth and education. The crisis came when the financial difficulties of the state, which had been increased by the help afforded to the American colonies in their struggle for independence from England, forced the government to call the Estates-General in 1789. Then followed the Revolution, an heroic struggle against foes within and without, in order to establish a new political and social order. The failure to set up an able and just

THE "HAUNTED DESERT" LEFT BY WAR



This is a street in the city of Verdun, as it looked after the first World War. Battered by months of cannon fire, it was reduced to a ruin as desolate as those ancient cities which have lain deserted for thousands of years in Oriental deserts. Later, the industry of the French made prosperity smile again in these areas, only to have them ravaged once more during the second World War.

government paved the way for Napoleon Bonaparte, who directed to his own profit the enthusiasm begot by the Revolution (*see French Revolution*).

French Revolution and Napoleon

As Emperor of the French (1804-1814) Napoleon attempted to make the French power supreme in Europe. The attempt failed, and in the peace of Vienna (1815) France was reduced to its former limits. But the great principles of the Revolution—nationality, constitutional government, and equality before the law—had laid the foundations not only of a new France, but of a new Europe. Perhaps the most permanent work of the Revolution was to give the French peasants the land, which they have continued to own to the present day. This wide distribution of land in small holdings remains characteristic of France and makes for conservatism.

But France was slow in accustoming itself to the new order. The Revolution of 1830 (July 27-29) overthrew the restored Bourbons—who had "learned nothing and forgotten nothing" in the great Revolution—and brought in the Orleanist prince, Louis Philippe, as a constitutional monarch. But he too fell in the Revolution of 1848 (Feb. 22-24); and after a tempestuous trial of a second republic, the Second Empire began under Louis Napoleon Bonaparte (nephew of Napoleon), who had a troubled but pretentious reign of 20 years (1851-1870) as Napoleon III.

The lightly begun but disastrous war with Germany (*see Franco-Prussian War*) ended the Second Empire.

For several years the government of France was then unsettled, but with the establishment of the Third Republic (1875) the political and economic affairs of the nation became more stable.

In the World War of 1914-18, France's democratic government survived, but French losses in man power and property were prodigious. More than one-fifth of the total population was mobilized, and losses in killed and wounded ran well into the millions. More than 9,000 square miles of northern France were occupied by the armies. This section contained approximately one-eighth of France's population and a great share of the nation's industries and mines. At the close of the war this region was one vast scene of desolation. Hundreds of towns, with their factories and homes, were deserted wastes. Millions of acres of once smiling farm land had been scarred with shell holes and trenches. (*See World War of 1914-18.*)

France After the First World War

The treaty of peace signed at Versailles, however, provided enormous benefits for France. Germany was brought to its knees. France took over a large part of Germany's colonies, and regained Alsace-Lorraine, which had been taken by Germany in 1871. As recompense for the damage done to its northern provinces, France was given a 15-year lease on Germany's Saar coal mines, and Germany was obliged to make huge reparation payments.

But these provisions brought trouble. Alsace-Lorraine under Germany had had local self-government, in-

cluding control of its own schools, in which Catholic religious instruction was given. In France, however, local government was entirely controlled from Paris and there was no religious training. But France finally permitted religious instruction to be given apart from ordinary classroom work. In 1923 Premier Poincaré was unable to collect reparation payments; so he seized the Ruhr Valley, Germany's most important mining and manufacturing district. This reduced Germany to bankruptcy, but forced it to sign an agreement for payments, called the Dawes Plan, in 1924.

Meantime France developed its other gains from the peace treaty. The Saar Basin and Lorraine gave it coal, iron, and potash with which to develop great steel and chemical industries. To secure its treaty gains France backed the League of Nations, which guaranteed the *status quo*; the Locarno Pact, by which Great Britain and Italy guaranteed its German frontier; and the Kellogg-Briand Pact, which outlawed war. Alliances were made with Belgium, Poland, Czechoslovakia, Yugoslavia, and Rumania. France built an unbroken line of fortifications (the Maginot line) along the German border, later extending this along the Belgian frontier. It increased its army and navy and made loans to its allies to permit them to build up their strength.

For a few years after the war, France's position was the strongest in Europe, but the cost of this policy of defense was greater than the nation could bear. After raising taxes as high as possible, Poincaré was forced, in 1926, to cut the gold value of the franc from 19.3 cents to about 4 cents. This cut off about four-fifths from the government's gold debt, and made French goods cheap for foreigners to buy. With a cheap franc it appeared that France might again be prosperous, and in 1929 a new reparation agreement, the Young Plan, fixed for the first time the total amount Germany was to pay.

But with the world economic depression, Germany again refused to pay. Then the Hoover moratorium of 1931 postponed payment; and a new agreement, reached the following year, practically wiped out the debt. France thereupon stopped repaying its war debt to the United States. The franc was no longer cheap by comparison, because Great Britain and later the United States reduced the value of their currencies.

Germany Challenges a Disordered France

With Hitler's rise to power in 1933, French supremacy on the Continent was challenged (*see Germany*). Hitler rebuilt the German army, navy, and air force, and he paralleled France's Maginot line with fortifications on Germany's side of the frontier.

The German menace found France almost paralyzed by economic difficulties and political strife. Successive French premiers struggled to balance the budget, reduce unemployment, and stem the rising cost of living. Distrust of political leaders grew when the public learned in 1934 that a swindler named Stavisky, aided by friends in high position, had forged and sold government bonds. As "Stavisky riots" broke out

in Paris, factional divisions widened and increased in bitterness. On the right were the *Croix de Feu* and other fascist organizations which threatened to seize power by force of arms. On the left were the Communists, who demanded economic relief under threats of revolution. Between these extremes were the Socialists, the more moderate Radical Socialists, and many other small parties. These together held a majority in the Chamber of Deputies, but they were seldom able to compose their differences.

Faced with the prospect of civil war and menaced by the growing power of Germany, Premier Laval in 1935 disarmed the fascist leagues, balanced the budget, and negotiated a pact of mutual assistance with Soviet Russia. But his vain efforts to win over Italy by supporting Mussolini's claims in Ethiopia helped to bring about his downfall.

Internal Struggles and Threats of War

Radical Socialists, Socialists, and Communists united in the general elections of April 1936, and won a smashing victory. Léon Blum, a Socialist, became premier of the new Popular Front government.

His first problem was the wave of sit-down strikes, called to force the new government to grant labor's demands for reform. Hastily Blum yielded and instituted the 40-hour week, substantial wage increases, vacations with pay, and the right to collective bargaining. Other radical changes included the nationalization of the Bank of France. But in his foreign policy, Blum held out against the parties of the left. When civil war broke out in Spain in July 1936, he adopted a policy of nonintervention. With Germany and Italy openly aiding the rebels and announcing the formation of the Rome-Berlin axis, Blum attempted to meet the danger by cooperating with England and by engaging in a heavy program of rearmament. But France's shattered credit could not stand the strain of both reform and rearmament, and in June 1937 the Blum government fell.

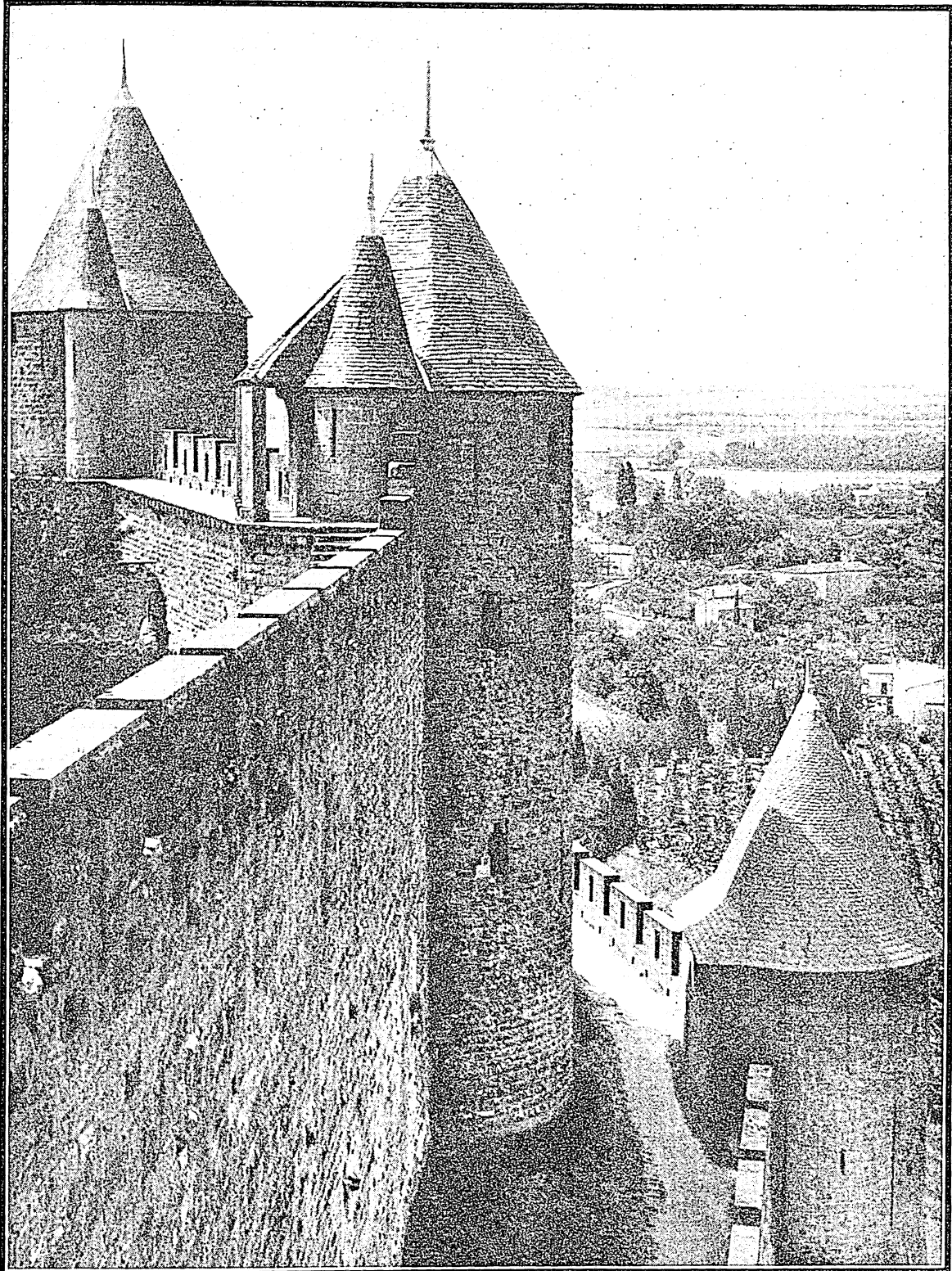
For almost a year there was political chaos. Then Hitler's seizure of Austria in March 1938 startled the quarreling factions into a semblance of unity. Édouard Daladier, Radical Socialist, became premier. He abolished the 40-hour week, devaluated the franc, increased taxes, and firmly put down strikes.

War and France's Speedy Defeat

But while Daladier sought to strengthen France, it became clear that another European war was about to break. Aware of France's unpreparedness and of the intense popular desire to avoid war, Daladier tried to stave off the conflict. With Prime Minister Chamberlain of England, he agreed at Munich to permit Germany to take Czechoslovakia. But when Italy seized Albania in 1939, the consequences of the spreading aggression became clear; and Daladier and Chamberlain pledged support to Poland, Rumania, Greece, and Turkey. When Germany then invaded Poland, France and England declared war, Sept. 3, 1939.

With Daladier as virtual dictator, France seemed to face confidently a war of siege. Cooperation with

TOWERS THAT GUARD OLD CARCASSONNE



These old double walls of Carcassonne, the best preserved medieval walled town in Europe, look today just as they did when they were defended by crossbowmen and knights. At the right you see the top of the high outer wall, with its towers pierced with slots for the bowmen and its battlements notched, or crenelated, for throwing down stones. At the left is the inner curtain wall, with its own towers and embrasures. Between them is the narrow list, in which supplies were kept for the defenders. This list is much narrower than usual, so that the besiegers would have little room in which to work if they took the outer wall. The 52 towers and two gates of the city were restored in the 19th century by the celebrated engineer Viollet-Le-Duc.

England grew to an unprecedented degree. But when Germany struck swiftly through the Low Countries on May 10, 1940, France revealed fatal flaws. Inadequate arms and out-of-date generalship demoralized the army. Class strife and fascist sympathy undermined national unity. The government was paralyzed

by defeatism and bungling. Under the stress of six weeks of *Blitzkrieg*, France was beaten into surrender. In the unoccupied remnant an authoritarian government was set up under Marshal Henri Pétain at Vichy. (For military events and the history of France in defeat, see World War, Second.)

—REFERENCE-OUTLINE for Organized Study of FRANCE—

FOR HUNDREDS of years France was the leading nation of the world, not so much because of the magnitude of its undertakings as because of the intellectual and artistic qualities of its people. In politics, literature, art, and science their influence was widely felt. Through the wars of the 18th and 19th centuries the country lost much of its prestige, but victory in the World War of 1914-1918 restored it to a high place among the nations. It became fourth in world commerce, and its vast colonial empire was second only to that of Great Britain. A notable list of high-grade manufactures, an abundance of iron in regained Lorraine, and a fine system of transportation combined to give it rich economic resources. And the patriotic spirit of its freedom-loving people made the story of France a stirring chapter in the epic of liberty.

But in the years of the world depression that began in 1929, class distrust and selfishness weakened national unity. It was a divided, bewildered, and feeble France that crumbled in 1940, and surrendered to Germany. With the Third Republic ended; and liberty submerged in semifascist rule, France faced the prodigious task of remaking its national life.

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FRANCIS I, KING OF FRANCE (1494-1547). When Luther launched his Reformation, in the early part of the 16th century, the destinies of Europe were in the hands of three young princes—Henry VIII, the imperious tyrannical ruler of England; Charles V, the cold, calculating, far-seeking king of Spain and emperor of Germany; and Francis I, the brilliant, ambitious, pleasure-loving sovereign of sunny France.

Francis I was born in 1494. He came to the throne in 1515, at the age of 21. He was the cousin of Louis XII, whose daughter he had married, and the death of Louis without sons gave the crown to Francis as next in succession. Like Henry VIII of England, Francis I was the embodiment of the spirit of the new age, and in his reign the Renaissance or "new birth" of learning and art, which had begun in Italy, flowered in France. He fostered learning and art, invited painters and scholars to his kingdom, founded libraries, opened schools of the New Learning, and built several of the finest palaces in France.

Not content with building up his kingdom within, Francis sought also to extend its boundaries by engaging in a series of wars with Charles V. His immediate object was to win the duchy of Milan in Italy; the more distant aim was to reassert France's claims to a supremacy throughout the whole of the Italian peninsula. These wars filled the greater part of Francis' reign and left France exhausted. He won a great victory at Marignano in 1515, but in 1525 he was defeated at Pavia and fell a captive into the emperor's hands. He was forced by Charles V to renounce his claims upon Milan, and to pay a huge ransom (1526). But as soon as he was free he revived his claims which he did not relinquish until 1544.

One unintended result of the long struggle over Italy was that it so distracted the attention of Charles V that Protestantism was given a chance to take root in Germany. In France, also, it found a fleeting foothold, only to be stamped out by Francis and his successors. The massacre in 1545 of the Waldenses or Vaudois, an heretical sect who had survived from the Middle Ages in the French Alps, also left a black stain on the memory of Francis I.

FRANCIS II, King of France (1559-1560), was the grandson of Francis I, the son of Catherine de' Medici, and the first husband of the famous Mary Queen of Scots. He was weak in mind and body and died before his 17th birthday, after a year of nominal rule.

FRANCIS JOSEPH I, EMPEROR OF AUSTRIA AND KING OF HUNGARY (1830-1916). As a sequel to the insurrections which swept the Hapsburg dominions during the revolutionary year 1848, the weak-minded emperor Ferdinand abdicated in favor of his 18-year-old nephew Francis Joseph. The uprising of the Czechs in Bohemia was put down by General Windischgrätz who afterwards bombarded Vienna into submission.

Lombardy and Venetia were reconquered by Radetzki, following two defeats of their ally Charles Albert of Sardinia-Piedmont. Finally Hungary, where the Magyars had proclaimed a republic under Kossuth, was crushed with the aid of a Russian army. The constitution which Francis Joseph had been terrified into granting was then withdrawn; and, until fresh violence again strained the seams of his patchwork empire, his German, Magyar, Slavic, and Italian subjects were ruled by an absolute despotism.

Austrian prestige suffered seriously in 1859 with the loss of Lombardy in war with France and Piedmont and in 1866 with the loss of Venetia and of leadership of the German states through defeat by Prussia. Hungarian disaffection once more became dangerous but this time prudent counsels prevailed over absolutism. The emperor in 1867 promulgated a constitution by which the empire of Austria and the kingdom of Hungary became two equal and almost independent powers, united only by the person of their common sovereign and by a common administration of military, financial, and foreign affairs (the "Dual Monarchy"). Francis Joseph retained a large measure of personal control, but he never again openly repudiated constitutional government.

To his mastery of the many languages and dialects of his polyglot realm, as well as to his tact, generosity, and attractive manners, he owed a large measure of popularity. Personal misfortune again and again assailed him. He lost his only son by suicide, and his wife by assassination; and popular sympathy inclined the more to him.

But, meanwhile, Austria had entered into close alliance with the German Empire, and together they pursued a fatally ambitious policy in the Balkans and the Near East. The assassination of the Austrian heir apparent, Francis Ferdinand, and his wife at Sarajevo, Bosnia, June 28, 1914, afforded a dramatic opportunity to strike the decisive blow which, in Francis Joseph's opinion, would settle Balkan affairs once for all. The ruthless harshness in the terms submitted to Serbia, which in the end plunged the world into war, was dictated by Francis Joseph personally. He did not live to witness the resulting utter ruin of Austria and the breakup of the Hapsburg states. (See *Austria-Hungary*; *World War of 1914-1918*.)

Two emperors of the Holy Roman Empire (Germany and the Austrian lands) bore the name Francis. FRANCIS I, son of the Duke of Lorraine, is chiefly notable as the husband of the heroic Maria Theresa of Austria, whom he married in 1736, and through whose influence he was elected emperor (see *Maria Theresa of Austria*).

FRANCIS II was the grandson of Francis I and was emperor 1792-1806. Napoleon's conquests so diminished his possessions that in 1806 he allowed the title of Holy Roman emperor to lapse. But as emperor of Austria he reigned over Hapsburg lands until his death in 1835.

FRANCIS OF ASSISI (*às-sē'zē*), SAINT (1182–1226). The father and mother stood in the doorway watching their young son playing gaily in the streets with his companions. Turning to his wife with an indulgent smile, the father said proudly, "Francis likes fine clothes and a gay life, and can spend money freely. Our boy is like the son of a prince, and will have a courtly career!" The merchant's wife nodded, but answered with a half sigh, "If he lives like the son of a prince now, hereafter he shall be a child of God!" The story is significant, if not historical. But even the mother little dreamed that this bright careless boy should one day become one of the most famous saints of the Catholic church, the founder of the order of the Franciscans, or Gray Friars, and one of the most beautiful characters in all history.

The future saint was born at Assisi, in central Italy, of a family named Bernadone. His father was a well-to-do merchant. In his early twenties, after a year's confinement as a prisoner of war and a serious illness, the old round of worldly pleasure no longer appealed to him. He sold his property, gave the money to the church, and began to tend the poor and the sick—even lepers. When his father disinherited him, Francis, wearing the worn-out robe of a gardener, supported himself by repairing tumble-down chapels around Assisi. At last, throwing aside even his stick, wallet, and shoes, he lived in absolute poverty.

Soon he began to attract followers. In ragged gray gowns, barefoot, and without money, the "Begging Brothers" went forth two by two to spread the gospel of service and poverty. As the brotherhood grew, members were sent to preach and serve in France, Germany, Hungary, Spain, and England. From Pope Innocent III they received numerous privileges. When a girl of 18 named Clare left her home to follow his teachings, Francis formed a separate order for women known as the "Franciscan Nuns," or "Poor Clares."

For the rest of his life "little brother Francis," as he called himself, continued his Christlike labors. In various parts of the world he made long missionary journeys, braving martyrdom in Mohammedan lands.

Legends have adorned the simple facts of his life with many charming incidents. It is said that he loved all living things, that wild rabbits ran to him for protection, and that wolves crouched like lambs at his feet. There is a famous account of his preaching to the little birds, telling them how thankful they should be to God, their creator. He was a poet, too, and his lyric lines, rugged and imperfect in form, are very touching and beautiful—particularly in his famous 'Canticle of the Sun'.

At his death in 1226 it is said that on his body were found the famous "stigmata"—the marks of the nails and the spear of Our Lord's passion. Two years later he was canonized (declared a saint) by the pope. He is lovingly remembered as the most blameless and gentle of all saints, the most Christlike figure of the Middle Ages. Twenty years after St. Francis' death his order had so grown that 9,000 religious houses had

been built. The Franciscan friars at one time numbered more than 100,000. Differences about the rules of St. Francis resulted in divisions of the order. In missionary work, in caring for the poor, in education, and in other good works, the Franciscans have continued as an active and influential order.

FRANCO, FRANCISCO (born 1892). Short, soft-spoken Francisco Franco became dictator of Spain almost by accident. He entered the Spanish civil war of 1936–39 with no political experience or expectations. The death or failure of the other rebel leaders thrust him to the fore.

Born at Ferrol in Galicia, the son of a naval officer, he was sent at 14 to a military academy. At 17 he was in Spanish Morocco fighting the Riffians. He rose rapidly—a major at 23, commander of the foreign legion at 30, and general at 34, the youngest general of the day in Europe.

Thereafter Franco's fortunes rose and fell with the change of governments. King Alfonso XIII, at the end of the Riffian War, made him director of a new military academy at Saragossa. When Alfonso lost his throne in 1931, the republican government sent Franco off to the Balearic Isles. A conservative government in 1933 brought him back as chief of staff of the minister of war. His quick suppression of a revolt of the Asturian miners proved that, despite his stature of only 5 feet 3 inches and his mild appearance, he was a ruthlessly efficient soldier. When, in 1936, a Popular Front government was elected, Franco was "exiled" to a post in the Canary Islands.

This proved a stroke of fortune for him. Before his departure, he had helped to plan a military revolt. When the plot exploded prematurely and its leaders at home were in confusion, Franco, free from interference, was able to carry out his share of the uprising. He flew to Morocco where he took command of his old African troops. Then he transported them by air to the mainland and launched the military campaign which ultimately won him the title of "El Caudillo"—the supreme "leader" of fascist Spain (*see* Spain).

FRANCO-PRUSSIAN WAR (1870–1871). The year 1870 found both France and Prussia eager to fight. Since 1866, when Prussia had defeated Austria and won the leadership in Germany, the leaders of the Second French Empire had longed to crush this upstart power. Meanwhile Bismarck, the chancellor of Prussia, felt that a war was necessary to unify Germany. War sentiment in both countries flared up when Bismarck published an altered version of the famous "Ems dispatch" (*see* Bismarck, Otto von).



FRANCISCO FRANCO

"Everything is ready," declared the French minister of war, "to the last button on the last gaiter." But when the French troops began to mobilize it was found that almost nothing was ready. There were horses without harness, cannon without ammunition, machine guns without men who knew how to use them. Prussia, on the other hand, had been so completely prepared by General von Moltke that all that was necessary was to "touch the button" to set in motion the greatest army organization then known. The plan for the invasion of France had been formed long before and all that was needed was to take the necessary orders from the pigeon-holes, date them, and send them out to the commanders. France moreover stood alone without a single ally, while the South German states and the North German Confederation rushed to the aid of Prussia.

In an astonishingly short time after war was declared (July 19, 1870), German troops invaded France in Alsace and Lorraine. The French troops met them as best they could, and though they fought bravely they were defeated in one battle after another between August 6 and September 2. One of their armies was "bottled up" in the strongly fortified city of Metz, while the other on September 1 was fighting before Sedan. This proved to be "one of the decisive battles of the world—a battle that resulted in the surrender of the largest army ever known to have been taken in the field, a battle that dethroned a dynasty and changed the government of France." On September 2 the French army of nearly 100,000 men, with the Emperor Napoleon III himself, surrendered as prisoners of war.

Such a terrible disaster to France astonished the whole world. The early defeats of August had been announced by the governments as victories, but the deception could no longer be kept up. When Napoleon's message—"The army has been defeated and is captive; I myself am a prisoner"—arrived in Paris, the mob began to cry "Down with the Empire! Long live the Republic!" The Empress Eugenie fled; a republic was proclaimed, and a Government of National Defense organized (September 4).

Siege of Paris; Rats at 60 Cents Apiece!

For five months longer this provisional government carried on the hopeless struggle. It was ready for peace, but was resolved that "not an inch of our soil will we cede, not a stone of our fortresses." After Sedan the Germans hastened on to Paris, and on Sept. 19, 1870, began the famous siege of that city. For four months the capital bravely held out. Early in the siege the fiery Leon Gambetta, head of the new government, escaped from the city in a balloon and worked desperately to raise new armies. But there was no possibility that they could break through the circle of iron around the doomed city. The sufferings of the Parisians during the siege were terrible. Dogs and cats were eaten. The price of rats rose to 60 cents apiece. Fuel gave out. Only when starvation was upon it did the city surrender (Jan. 28, 1871).

The war was at an end. A government recognized by Germany was formed, with the aged statesman Thiers at its head, and made peace with Germany (Peace of Frankfort, May 10, 1871). The victors demanded harsh terms. The greater part of Alsace and Lorraine was to be given them. An indemnity of one billion dollars was to be paid, and until it was paid a German army was to remain in France. France was also humiliated by the German troops marching in triumph through the streets of Paris, and by the proclamation of the new German Empire (Jan. 18, 1871) in the French royal palace at Versailles. The hatred that these acts of the Germans aroused was not forgotten at the close of the World War of 1914-18, when the tables were turned and the French were victors and the Germans the vanquished.

Then Came the Commune

As though Paris had not endured enough during the siege and bombardment by the Germans, there occurred a desperate revolt in the city against the new government. The Parisian working men still had their arms, and they feared that the assembly would try to overthrow the new republic, so they rebelled and set up a government called the "Commune."

This revolt broke out on March 18, and lasted until near the end of May. Again the city was besieged, but this time by the French troops of Thiers. When the government troops entered the city there followed a week of fierce civil war. Indeed, Paris suffered more from the Commune than from the Germans. When at length the revolt was put down no mercy was shown the rebels. Hundreds were shot without trial. More than 7,000 were sent as convicts to New Caledonia, in the South Pacific Ocean, and thousands more were sentenced to imprisonment at hard labor. In addition to the legacy of hatred left by the war between France and Germany was the bitter anger of the French working classes for the new "bourgeois" republic, which enfeebled it for 20 years or more (see France).

FRANKFORT-ON-THE-MAIN, GERMANY. "An old picture in a new frame," Frankfort has been called. Within a circle of ramparts that guarded the city in the 12th century are narrow gabled houses and towering churches of medieval days. Spreading out from them are splendid new buildings, spacious green parks, and public forests, for historic old Frankfort has become a model of modern community planning.

It is situated in a fertile plain of southwestern Germany, on the Main River, surrounded by the wooded Taunus Hills. Standing at a natural crossroads of trade, Frankfort (German *Frankfurt*) has from its earliest days been a center of commerce and banking. From the small money-lending shop, *Zum rothen Schilde* ("At the Red Shield"), of Mayer Anselm Bauer in its cramped ghetto sprang the House of Rothschild, which became the largest private bank in Europe (see Rothschild Family). Frankfort's key position on trade routes has also made it a center of Germany's communications by railroad, river shipping, and airplane.

It was bombed only slightly during the first World War and heavily bombed during the second.

No other city has had a more distinguished rôle in the pageant of Germany's imperial history. As early as the time of Charlemagne, it was the chief settlement on the Main. At that time it got its name, which means "Ford of the Franks," and became the seat of many imperial councils. There Frederick Barbarossa was elected ruler of the Holy Roman Empire, setting the precedent for later emperors. This tradition became law in 1356 when Charles IV issued the Golden Bull, making Frankfort the electoral city of the empire. After 1816 the German Diet (parliament) met there. During the revolutionary period of 1848, the city was a battleground of civil conflict. One of the four free cities of Germany, Frankfort did not finally lose its independence until it was annexed by Prussia in 1866. History was again made in the old

city on May 10, 1871, when the Peace of Frankfort was signed there to end the Franco-Prussian War.

The beauty and antiquity of Frankfort, its professional and art schools, and its nearness to such famed health resorts as the Wiesbaden spa all combine to make it a favorite tourist center. One of its most beloved historic shrines is the boyhood home of Goethe, who was born there in 1749. Adjoining it is the Goethe Museum. In the suburb of Sachsenhausen is the Stadel Art Institute, which has one of the best German collections of engravings.

Frankfort and its suburbs have developed numerous industries. The chief products include machinery, clothing, carpets, rubber, tobacco, chemicals, and electrical equipment. Once the center of German book printing, Frankfort is still a publishing center, and an elaborate monument honors Gutenberg and other early printers. Population, about 555,000.

From PRINTER BOY to SCIENTIST and STATESMAN

How a Good Resolution, Well Kept, Changed a Bumptious Youth into One of the Most Famous of American Patriots, Diplomats, and Men of Letters

FRANKLIN, BENJAMIN (1706-1790). There is something perennial about the spirit of this great American patriot of civil life, philosopher, statesman, diplomat, and writer. Though born in the infancy of science, and dying in the infancy of the republic he had helped to establish, he projects himself into the interests and problems of today and of all times as does no other man who figures in American history. His many-sided genius, sound common sense, practical citizenship, hospitality to new ideas and ideals, and his moral courage make him a character to whom men of any age must have turned with confidence.

There is nothing in Franklin's ancestry or environment to account for him. In the family history for four centuries behind him there had not been one man who rose above mediocrity. In England the Franklins were small landed proprietors or tradesmen in Northamptonshire, simple, industrious, pious. The father emigrated to Boston in 1682, and set up in business as a candle-molder and soap-boiler. His fifteenth child was christened Benjamin at the Old South Church and dedicated to the ministry. Lack of money for the necessary education forced the boy to learn the printer's trade. Disputatious, sarcastic, vain, resenting control and given to expressing original opinions, the boy was not any too popular in the strict Puritan town. So, at 17, he ran away to Philadelphia. He landed with a silver dollar, a trade, plenty of self-confidence, and a suddenly formed resolution to turn over a new leaf, thus showing remarkable strength of character. Ever afterward he was noted for his good manners, avoidance of controversy, and patience.

At 23 he owned his printing office and was publishing the *Pennsylvania Gazette*, which survives today in *The Saturday Evening Post*. For the next 20 years

he was the foremost journalist in the colonies. *Poor Richard's Almanac*, issued annually for a quarter of a century, made him known from city mansion to the remotest frontier cabin. While making fame and fortune as a printer, publisher, and writer, he was studying foreign languages and literatures, experimenting in science, and taking a conspicuous part in local affairs. From 1736, when he was chosen clerk of the Pennsylvania General Assembly, until 1785, when he returned from Paris at the close of the American Revolution, he was almost continually in the public service, and this without compensation. Big and little things alike claimed attention. Now he was organizing a police or fire department or local militia; now putting a street lamp before his gate and paving his sidewalk to rouse public spirit; organizing an Academy of Science; or a church free for all denominations; collecting books for the first free circulating library; organizing a system of colonial defense against the Indians; inventing rockers for his easy-chair and a portable fireplace, called the Franklin stove, for which he refused to take out patents. He always declared that as we are indebted to the ingenuity of men in the past, so it is only our duty to give our contrivances to the present and future. Although his early plans for a union of the colonies presented at the Albany Congress failed, as Deputy Postmaster-General under the crown, during a score of years, he linked them together with the ties of the postal service.

How He Served His Country Abroad

After 1747 (his 41st year) Franklin spent over a quarter of a century more or less continuously abroad in the services of his country. His discovery of the identity of lightning and electricity had already made him the best-known American in Europe (see Elec-

tricity). Learned societies and universities welcomed him, and he soon won equal distinction as a diplomat. Sixteen years in all he spent in London as the agent of the colonies. His chief triumph was in getting the Stamp Act repealed. An eminent English statesman declares that had the king and Parliament accepted Franklin's just contention that the American colonies were self-governing, owing allegiance only to the sovereign, the Revolutionary War might never have been fought.

Franklin, after more than a decade of working in vain for agreement between the mother country and the colonies, returned to help frame in Congress the Declaration of Independence, and to place \$20,000 of his fortune at the service of Congress. He then crossed the sea once more, in December 1776, to win the help of France to the cause of American liberty. His position in Paris, although he represented poor rebel colonies, was extraordinarily influential, such as has rarely been equaled in the history of diplomacy. Camp and court and the world of science were at his feet. His simple dress became the fashion; his kindly face adorned ornaments of cameo; his portrait was in college, palace, and cottage. He was the first great plebeian standing upright before kings, and he fired the imagination of the people as he charmed the aristocratic court.

Franklin as the Ideal American

It is flattering to our pride to learn that the mind, character, and versatile genius of Franklin have been called an epitome of all that is best in the typical American. He won by straightforwardness. He had shrewdness, good nature, open-mindedness, persistence, and infinite knowledge of the world and of human nature.

When Franklin returned to America in 1785, he was in his 80th year and begged for rest. He could not decline the office of chief executive of Pennsylvania, nor membership in the constitutional convention of 1787 that drafted the Federal constitution. In spite of the infirmities of age, he continued to give scientific discoveries to the world. His last public act was to affix his signature to a memorial to the state legislature, as president of the Pennsylvania society for the abolition of negro slavery.

No life of Franklin is comparable to his own autobiography. As literature it is a classic, and as a human document it is unsurpassed in its candor.

FREDERICK, EMPERORS OF THE HOLY ROMAN EMPIRE. During the Middle Ages three rulers of that loose government which included Italy and Germany known as the "Holy Roman Empire" (see Holy Roman Empire), bore the name of Frederick.

FREDERICK I (BARBAROSSA) of the German house of Hohenstaufen ruled from 1152 to 1190, and was not only the greatest of the Fredericks, but was also, in many respects, the ideal emperor of the Middle Ages. He had a lordly appearance though he was only of medium height. His hair was yellow, and his red beard led the Italians to nickname him "Barbarossa"

or Red-Beard. His ambition, as he wrote the pope soon after he became emperor, was to restore the position of the Roman Empire to the place it had occupied under the Caesars and under Charlemagne. To do this, he set about learning his rights as emperor and then attempting to enforce them.

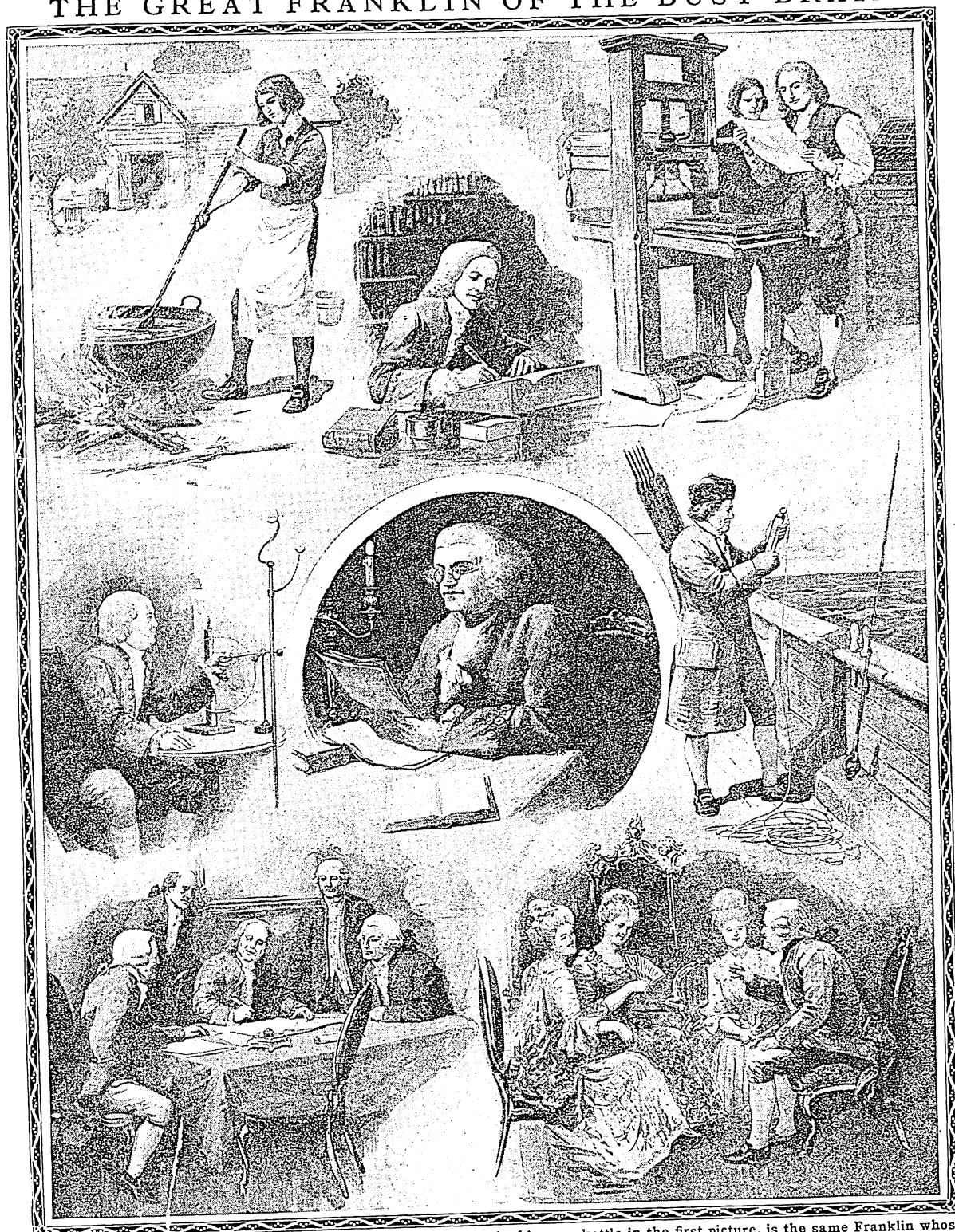
But times had changed since the days of Charlemagne. Frederick had the strong city republics to contend with in Italy, and furthermore the pope was playing a larger part in European affairs than was formerly the case. In his attempt to govern the Italian towns, Frederick was eventually defeated by the "Lombard League" of northern Italy. These cities were henceforth practically independent, only the shadow of power being left to the emperor. Frederick was likewise unsuccessful in his contest with the pope, and was forced to humble himself before the head of the church (1177), much as Henry IV had done at Canossa, just one hundred years before.

In Germany, however, Frederick was more successful than in Italy, and his reign marks one of the most brilliant epochs in the history of medieval Germany. He established his power over the turbulent German nobles. The land was cleared of forests, agriculture was improved, and the country advanced in wealth and in culture.

Toward the end of his reign, Frederick Barbarossa "took the cross" and joined the Third Crusade. Before he reached the Holy Land he was drowned in a little stream in Asia Minor. Later generations, recalling the splendors of his reign, transferred to him a legend which had grown up about another German Frederick. He was not dead, they said, but was sleeping in a rocky cavern of a German mountain; when the ravens ceased to fly about the summit of the mountain, Barbarossa would awaken and return, to restore to Germany the glories of former times.

FREDERICK II, the grandson of Frederick Barbarossa, inherited the kingdom of Sicily from his mother when he was three years old, but it was not until his troops defeated those of a rival emperor, 17 years later, that he could claim the title of "Emperor of the Holy Roman Empire" (1215-1250). He was known as "the wonder of the world" because of his varied attainments. He was a poet, a lawgiver, and political reformer, and has sometimes been called the "first of modern men." His court in Sicily, where he spent most of his life—largely under Saracen influence—was the most splendid in Europe, and the laws of that kingdom the most advanced. But he neglected Germany in order to defend himself against the pope in Italy. The nobles and the towns north of the Alps came to exercise rights which belonged to the emperor, and Germany grew more and more into a confused mosaic of city states and feudal principalities. Frederick's going on a crusade (1228-29) was a mere episode in his conflict with the pope. Frederick was able to maintain his power until his death in 1250; but soon after that date the triumphant papacy over-

THE GREAT FRANKLIN OF THE BUSY BRAIN



That sturdy Ben Franklin, the soap-boiler's son, who is stirring the big soap kettle in the first picture, is the same Franklin whose genial wit and shrewd comments on life made him a social favorite among the aristocratic ladies of Paris, as shown in the last picture in the series. At 20 we see him as a printer looking over one of the sheets which have just come from the old hand-press. At 25 he is in the newspaper business and his comments on public affairs are being widely read. In the center picture we see him in his library—thumb under chin, his favorite attitude when reflecting. On the left of this picture he is making experiments with electricity; on the right he is testing the temperature of the Gulf Stream, from the deck of the vessel which is carrying him to England. Next we see him taking part in the peace negotiations which ended the American Revolution.

threw with French aid the whole Hohenstaufen house, root and branch.

FREDERICK III, who ruled from 1440 to 1493, was the first important ruler of the Hapsburg house, and his reign is called "the longest and dullest of all the reigns in German history." He was slow, poor, and powerless. All he could do was to watch the course of events, consoling himself with gardening and astrology, and muttering his favorite maxim, "What can't be helped had best be forgot." One thing he accomplished which left a lasting impression on history. A marriage treaty was made with Hungary by which that kingdom eventually became a Hapsburg possession. Frederick thus began that policy of "fortunate marriages" which built up the Hapsburg power.

FREDERICK THE GREAT, KING OF PRUSSIA (1712-1786). As a boy Frederick II, future king of Prussia, had a hard time. His father, rough old Frederick William I, planned an education for his heir that was military, practical, matter-of-fact. But the boy was fond of music, literature—especially French—and art. He hated military exercises; he would rather play the flute than play soldier; he detested tobacco, heavy eating and drinking, and hunting, which appeared to his father the natural manly and royal pleasures. The king forbade the prince's tutors to teach him Latin because it "had no practical use"; but Frederick studied the classics when his father knew nothing about it.

As Frederick became older matters grew worse. His mother and his sister Wilhelmina, a spiteful little minx who has left her story in print, sided with him against the father. The thought that this youth, so interested in the pleasures of life and so carelessly self-indulgent, would one day be king and would probably wreck the Prussian state by his incompetence, enraged the tyrannical, hard-working Frederick William, who thought only of Prussia's greatness. He became more and more severe with his son, even caning him in the presence of the army and boxing his ears in public.

When Frederick was 18 years old he decided to escape the tyranny of his father by running away. It was a wild scheme and he was caught before he crossed the border. He was kept in solitary confinement for

a time, and from the window of his cell he was forced to watch the execution of his most intimate friend who had accompanied him in his flight. For a time the enraged king even thought of putting his son to death as a military deserter.

FREDERICK THE GREAT



The "Iron King" of Prussia, who, in his youth, preferred to play the flute rather than to play the soldier.

After this Frederick was changed. The iron had entered his soul and the father's discipline had triumphed beyond his fondest hopes. Frederick became self-contained, crafty, and cynical, but sobered and outwardly submissive. As the king said, he no longer "kicked and reared." He spent several years in the prosaic task of administering minor offices and learning the dry details of administration. Gradually his father entrusted him with greater responsibilities.

When he came to the throne, at the age of 28, Frederick had a keen mind, a character of iron, and an ambition that was soon to set the world on fire. He ruled for 46 years (1740-86). The first 23 years were devoted chiefly to unscrupulous warfare; the second to peace and recovery. The first half of his reign made it evident that as a soldier he had no equal in Europe; the second half showed him as one of the enlightened despots of the 18th century. Frederick worked hard himself, rising at 3 o'clock in the summer and at 4 in the winter. He was his own prime minister

and his advisers were treated like clerks. But in his leisure hours Frederick wrote poetry and history and brought the French philosopher Voltaire to his palace of Sans Souci in Potsdam. But Voltaire wanted to be an arbiter of learning, not a mere corrector of Frederick's French, so the two quarreled. Voltaire left with a trunkful of Frederick's writings that the king did not desire made public, so Voltaire was stopped at Frankfurt and his luggage searched.

War Becomes Prussia's "National Industry"

This man, who as a youth had hated the life of a soldier, plunged all Europe into war immediately after he came to the throne. Following his own advice—"Take what you can; you are never wrong unless you are obliged to give it back"—he seized the rich Austrian province of Silesia and so began a great European conflict (see Seven Years' War). It was in this struggle, lasting more than a score of years, that Frederick by his military genius won the title "the Great." He had truly made war "a national indus-

try" in Prussia, and his motto was *Toujours en vedette* ("Always on guard").

During his reign he nearly doubled his kingdom in size, for he not only compelled Maria Theresa to cede Silesia to him, but also seized part of Poland in the first partition of that unfortunate country in 1772 (see Poland). In peace he vastly increased its resources by draining marshes, clearing forests, encouraging industries, opening schools, welcoming and favoring immigrants. Frederick reorganized the army, replenished the public treasury, and remodeled the legal code. He gave the Prussian nobility an assured place in the army and diplomatic service. He proclaimed himself "the first servant of the state," but it was a state which every class must serve in the way appointed by the sovereign, whose power was absolute.

Frederick raised the crude sprawling state of Prussia to the rank of one of the first powers in Europe, and gave it by his military successes and his crafty diplomacy the stamp of his own character. Strangely enough this greatest of the Hohenzollerns spoke and wrote French almost exclusively, and had France for an ally in his first wars. He died on the eve of the French Revolution, which was to shake forever the power of kings, and so was in a certain sense the last absolute king in western Europe. (See Prussia, Germany.)

FREDERICKSBURG, BATTLE OF. One of the bloodiest and most humiliating defeats suffered by the Union forces in the Civil War was that at Fredericksburg, Va., on Dec. 13, 1862. After his retreat from the north in consequence of his defeat at Antietam, Gen. Robert E. Lee with about 78,000 men had established himself on the high bluffs of the Rappahannock River near Fredericksburg. The Army of the Potomac, numbering about 120,000 men, under Gen. Ambrose E. Burnside, held the north bank of the river at Falmouth. Under great difficulties, Burnside got his men across the river on pontoon bridges, and attacked the strongly intrenched Confederates on the 13th. After six assaults had been repulsed with great loss, Burnside was dissuaded from renewing the attack; and on the night of the 15th, under cover of a storm, what remained of the Union Army was brought back to Falmouth. Burnside lost 12,653 men, while the Confederate loss was 5,309 men. As a result of the defeat, Burnside was relieved of his command a week later, and Gen. Joseph Hooker was appointed to succeed him.

The gloom in which this disaster enveloped the North was changed to rejoicing a few weeks later by the news of the Union victory in the battle of Murfreesboro, or Stone River, Tenn. (Dec. 31-Jan. 2) when the Confederate forces under Gen. Braxton Bragg were repulsed by Rosecrans' army. This repulse opened the way for the Union advance to Chattanooga, and eventually to "Atlanta and the sea."

FREEMASONS. The origin of the secret society known as the Ancient Free and Accepted Masons has been variously traced by tradition. It is said to have arisen from guilds of masons or stone-workers, which

sprang into being in the Middle Ages; in order that traveling members might be accepted by their brother craftsmen they made use of secret signs and passwords. With less warrant other stories carry the origin of the order back to the building of the temple at Jerusalem in the days of Solomon.

Scotland possesses the earliest record of the presence of masons in lodges. Modern freemasonry, with the three symbolic degrees (apprentice, fellowcraft, and master mason) of the "blue lodge," dates from the early part of the 18th century. It was introduced into America in 1730; and nowhere is masonry held in greater honor or importance, as is shown by the fact that two-thirds of the Masons of the world are in the United States.

There have been many Masonic rites, chief of which are the English, American, and Scottish. All are based on the three "blue lodge" degrees, to which others are added in varying number and order. In all, the emphasis is on the member's duty to his family, his country, and his God, and to aid his fellow members. A set of passwords and a peculiar grip of the hand enable the initiated to recognize one another.

The Order of the Eastern Star is made up of women relatives of Masons and of Master Masons. It was founded in 1868.

FREEZING. Mix some cracked ice or snow with a couple of handfuls of salt in a bucket and stand a test tube of water in it. You will notice that a thermometer placed in the water will fall slowly until it registers 32° F. At that point the water will begin to freeze and the temperature will remain unchanged until all the water has turned into ice. Thus you have learned that the freezing point of water is 32° F. Now if you take the test tube full of ice and plunge it into warm water, you will find that the thermometer does not begin to rise until all the ice has been melted. In other words, the freezing point and the melting point of water are the same.

A great many other substances, like water, may be frozen or changed into the solid form by cold, and melted into the liquid form by heat. You have often seen how butter melts on a hot day, and then solidifies or freezes again when it is put in the ice-box. And perhaps on a camping trip you have melted the solder off the spout of a coffee pot or a tin pail by letting it get too hot.

In the case of crystalline substances, such as ice and many metals, the melting and freezing points are the same. Non-crystalline substances, like wax, butter, glass, and iron, do not have a definite melting and freezing point. As heat is applied to them in their solid form they gradually soften, becoming first like a very thick liquid, and finally flow freely.

Most substances contract as they freeze, but you know from experience that this is not true of water. You have probably seen water pitchers and pipes burst by the pressure of the water as it freezes. This also explains why ice floats. A cubic foot of water becomes 1.09 cubic feet of ice, and therefore as the

little ice crystals form in the water they rise to the top and unite to make a solid surface of ice. Another interesting result of this tendency of water to expand as it freezes is that pressure will lower its freezing point. You can prove this by suspending a heavy weight by a wire loop passing around a block of ice. The wire will slowly cut all the way through the ice, but the block will remain perfectly solid as before. That is because the pressure of the wire gradually melts the ice, which again freezes as soon as the wire has gone through and the pressure has been removed. So, too, in skating, the pressure of the skate blade on the ice melts a thin film of water which is very slippery. The same principle explains why glaciers—solid rivers of ice—can flow around corners.

In the experiment with which we began you learned that the temperature of melting ice did not change until all the ice had been changed into water. All the time the melting process is going on, the ice is absorbing heat from surrounding objects. It is on this principle that refrigerators work. This also explains the use of the *freezing mixture* of salt and ice we employed. Salt absorbs water very readily, even from ice, thereby melting it and forming a salt solution, or brine. But the freezing point of saturated brine is about -7°F ., or 39 degrees below the freezing point of water. So, as the ice melts, it absorbs heat from the brine, which gets very cold. A freezing mixture of salt and ice is used in making ice-cream and artificial ice. The freezing point of a solution of calcium chloride is even lower, so this substance is also much used in refrigeration.

FRENCH AND INDIAN WAR. In 1754 began the last dramatic act in a series of contests between France and England for the possession of North America. Three wars between the two countries—King William's War (1689-97), Queen Anne's War (1701-13), and King George's War (1744-48)—had failed to bring a final settlement, and each side saw that it would have to throw more energy into the struggle if it would secure the great Ohio valley.

The French made the first move by beginning the building of a chain of forts extending from the St. Lawrence to the Mississippi. The land they were thus occupying was claimed by the colony Virginia under her "sea-to-sea" grant from the English crown, so the governor of the colony dispatched a small force under young George Washington to capture the French post, Fort Duquesne, on the present site of Pittsburgh, Pa. The expedition was unsuccessful and Washington had to surrender to superior forces.

The final war with France in America thus opened with bad luck for the English, and the next year (1755) was still more disastrous. General Braddock, who had been sent from England with a strong force of British regulars, was disastrously defeated and his

army almost destroyed in his advance upon Fort Duquesne. He had not heeded the warnings of Washington, who knew how the French and Indians fought behind trees and rocks, but had marched into the wilderness with drums beating and banners flying. As was to have been expected, he was surprised and defeated by the enemy. He himself was mortally wounded, and his army would have been totally destroyed had it not been for Washington's skilful management.

By that time the struggle in America had become merely a part of a great conflict—called in European history the Seven Years' War—in which the grasping Frederick the Great of Prussia fought Austria with England's aid, and France was the ally of Austria. For France and England it was strictly a struggle for

sea power and colonial rule, and it was fought in India, in Europe, and on the sea, as well as in North America. Success came to the British armies, due in a large measure to the able statesmanship of the prime minister, William

Pitt. In a little while "the wind, from whatever quarter it blew, carried to England the tidings of battles won, fortresses taken, provinces added to the empire."

In America during the two years following Braddock's defeat the English colonies were hard pressed. The British offensive had failed and the Indian allies of the French plundered settlement after settlement along the border. The fall of Forts William Henry and Oswego on the New York frontier left that colony open to the ravages of the French. But in 1758 the tide turned. Pitt sent out a well-equipped army and fleet which, with the assistance of the colonial troops, captured Louisburg on Cape Breton Island, Fort Frontenac on Lake Ontario, and Fort Duquesne. The French line of forts was now broken and the next year Fort Niagara, Ticonderoga, Crown Point, and Quebec fell to the victorious British.

The most spectacular as well as the most important victory in North America was the capture of Quebec in 1759 (*see* Quebec, Canada; Wolfe, James). This practically sealed the fate of France in America, though the treaty of peace was not signed until 1763. France gave to England all of her vast possessions in Canada and east of the Mississippi River,—except New Orleans, which went to Spain along with the French territory west of the Mississippi. England also gained Florida from Spain (returned in 1783); thus the Union Jack floated over all the land east of the Mississippi and over Canada. In addition an end was put to French rivalry with the British in India. For America the war decided that the future United States should be English in speech and institutions and not French, largely Protestant in religion, and self-governing rather than despotically ruled.

TABLE OF MELTING OR FREEZING POINTS

| | | | |
|--------------------------|----------------------------------------|---------------------|----------------------------------------------|
| Alcohol, Ethyl | -202°F . | Olive Oil | about 30° to 43°F . |
| Carbon | -6332° | Paraffin | about 90° to 180° |
| Copper | 1981° | Silver | 1761° |
| Glass | about 1160° to 2420° | Steel | 2066° to 2752° |
| Gold | 1945.5° | Sulphur | 235° to 246° |
| Lead | 621° | Tin | 449° |
| Mercury | -38° | Water | 32° |

The CLEAR and CHARMING LANGUAGE of the FRENCH

FRENCH LANGUAGE AND LITERATURE. The parent language of French, as of the other Romance languages, is Latin (*see* Romance Languages). Traces of this parentage are clearly to be seen in the great number of words that have come directly from Latin. Such words as *pere* ("father") from the Latin *pater*, and *mere* ("mother") from the Latin *mater* clearly show this origin. Latin derivatives like these, indeed, constitute the bulk of the French vocabulary. French words, in the main, are simply Latin words which have been modified by natural development through the centuries.

Of the various dialects of Latin which sprang up over Europe during the early centuries of the Christian era, French was the first to be recognized as a separate language and the first to develop a literature. By the 9th century the dialect spoken in the north and center of what is now France, and that spoken in the south, had developed such marked differences that they were known by distinct names. The tongue (*langue*) of the south was called the *langue d'oc*, and that of the north the *langue d'oïl*, from the fact that the word for "yes" in the south was *oc* and in the north *oïl*.

Out of this northern tongue has developed the French language of today, a language which yields to none in clearness and richness. Of both the language and the literature which has sprung from it, the first and sharpest impression that the student receives is indicated in the famous remark, "That which is not clear is not French." More can be tucked away in a French sentence with less effort and less ambiguity than in any other modern tongue.

Fine Shades of Meaning in French

Not that in French it is necessary to express all thought bluntly and crudely. Black must be black and white, white, but there is much that is also gray; and for all fine variations of meaning, for delicate differences, French is the perfect tongue, because even in vague, cloudy matters, French must be clear. The very word *nuance*, by which the French indicate a subtle distinction, is appropriated by us in default of an English equivalent, just as our vocabulary has taken over many other French terms for the same reason.

But all this crystalline perfection, like every perfection, is bought at a price, and the price in this case is poetry, mystery, sentiment. For the French people, of whom the French language is the natural product and expression, are anything but mystical or sentimental. The advice of the philosopher Comte, "Feeling should always sway the mind," has no close grip upon the French—that logical, reasoning, real-

istic, methodizing race, formed so as always to see the point, often to their own inevitable boredom and dismay.

If only a little illusion, a little dull dreaminess, a little fear and doubtfulness could sometimes veil their penetrating and yet incomplete vision! Especially does this wish arise when one sees a bit of fluting Italian, or rich, pithy, bright English, translated into the uncompromising clearness of French. Yet to endow French more abundantly with "such stuff as dreams are made of" would be to rob it by just so much of its admirable lucidity.

The "Social Literature" of the French

This love for preciseness and clearness in literature is sharpened by the French social instinct. More than any other people, the French put the emphasis on society; less than any other do they interest themselves in the individual—his whims, his eccentricities, his special moods and traits. For this reason they have a "social literature,"

that is, a literature which concerns itself with matters of general social interest, rather than with the personal problems of the individual. Their writers remain within the illuminated circle of common experience, and seldom explore the uncommon, the mystic, the fantastic. Thus it happens that they are sometimes charged with being unoriginal and even superficial, especially by certain German critics.

With these charges in mind, Ferdinand Brunetière, one of the great modern French critics, has tartly replied: "The Frenchman piques himself on speaking clearly about matters which are sometimes profound, but the German seems to glorify himself too often on stating obscurely matters which are clear." The statement puts the French idea perfectly.

Brunetière is right in contending that in depth French literature compares favorably with any other. But it has a profundity of intelligence rather than of emotion, its fine distinctions are of thought rather than of feeling, its beauties are more often of form than of content, its triumphs are analytical and concrete rather than poetical or visionary.

Not a Language for Poetry

In view of such qualities as these in the French mind, it is therefore not surprising that French literature has gathered more laurels in prose than in poetry, whose very fabric is reverie, the intangible, the inscrutable. The French ardor for beauty of form has rendered their verse forms somewhat severe and rigid, though most graceful, elegant, and polished. Besides, no matter how clever the technique of the

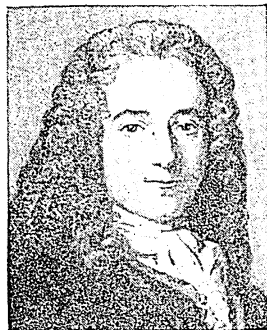


MOLIERE
The Genius of French Comedy

poet, the French language, with its nasal sounds and tapping monotone, is not an organ from which the sweetest music may be drawn. In any case,—

Heard melodies are sweet, but those unheard
Are sweeter.

and the unheard melodies of pure poetic fancy are



VOLTAIRE
Master of Satire

somehow not a part of the French gift for delicate thinking rather than delicate feeling. Consequently if a reader is familiar with the subtle fairy singing of English poetry, the supple sensuous beauty of Italian, reminiscent of the arts of music and sculpture, or even the long, low rumble of German—that reader is often inclined to feel that French verses tinkle out in rhyme some

very soulless and conventional thoughts.

But in tasting the delights of French prose there are no such secret protests to suppress. Here French clearness, French elegance, French insight, truly come into their own. Where English prose sprawls in abundance, the French is fine and shapely. Where the German and the Italian are often disposed to flounder in sentimentality, the Frenchman is keen, firm, unmuddled. Where the Russian turns morbidly in upon himself, the Frenchman is incorruptibly sound and sane, irrepressibly gay. In a world bitter with prejudice and flighty with wild dreams, the Frenchman seems able to see with clear eyes, to perceive with a cool heart. He is even exasperatingly right. If he does not sail among the stars, he does indeed “possess the mountain winds of truth.”

Such have been the distinctions of French literature through a long history, so long and rich and complicated that any brief account of it becomes merely a roll-call of world-famous names.



DUMAS THE ELDER
King of Romancers

Beginnings of French Literature

But before we come to the first of these names, that of the chronicler Froissart, there is a vast mass of folk-epics in verse, of lyric poetry, of mystery and miracle plays, and of chronicles. (See Drama; Roland; Romance.) As in all other literatures verse preceded prose, and it was not until the 14th century that we find any consider-

able body of prose composition. This took the form of history, or chronicles, represented at their best by Froissart, the famous contemporary of Petrarch in Italy and Chaucer in England, who enriched and invigorated the French tongue much as Petrarch did Italian and Chaucer English. Soon after Froissart came Villon, the vagabond poet, whose hauntingly sweet and powerful lyrics stamp him as the greatest figure in French literature up to the time of the great men of the 16th century.

These creative geniuses—Rabelais, the jovial humorist and satirist; Montaigne, first and greatest of the modern essayists; Calvin, the luminous theologian; Ronsard, the elegant and original poet—these were the men who molded the French tongue into much the form it has today, expanding its resources, and making it the

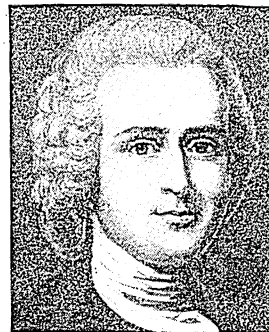
pliable, powerful vehicle of one of the world's greatest literatures. The French translation of the Bible, made in the 16th century, was a factor of weight in shaping the modern French language, in the same way that the development of English, German, and other European tongues was vitally influenced by the popular versions of the Scriptures.

During the closing years of the 16th and the opening years of the 17th century, while Shakespeare was liberating English poetry from its dreary formalism and artificiality, Malherbe, poet and critic, was busy in France framing

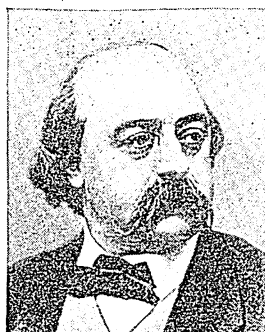
a rigid form and cramping tradition for French poetry. In the 17th century came also the first of the *salons*, or fashionable literary gatherings of Paris, and the establishment of the French Academy, two powerful factors in the cultivation of taste and a sense of literary form. (See Academy, French.)

In the Days of “the Grand Monarch”

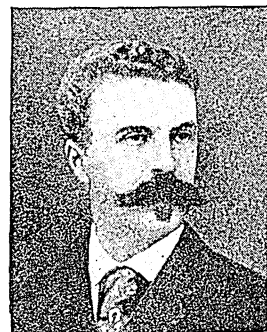
One of the golden ages in French literature was the reign of Louis XIV (1638–1715), the monarch who declared, *L'Etat, c'est moi* (“I am the state”), and raised France to the position of the leading state in Europe. During his heyday flourished the three dramatic giants, Corneille, Racine, and Molière; the preachers Bossuet and



ROUSSEAU
Who Stirred Revolt



FLAUBERT
Father of French Realism



DE MAUPASSANT
Magician of the Short Story

Fénelon; the theologian Pascal; the poet Boileau; the inimitable letter-writer Madame de Sévigné; the wits La Rochefoucauld and La Bruyère; and many another of that great generation.

Then came the amazing, mocking Voltaire—sharply rational, gay, capricious, witty, chatty, vindictive, generous, "the spoiled child of genius," who attacked superstitions and social abuses on every hand and turned off scores of fat volumes, now widely unread. In his time he was "a founder of the future." His influence lay over all France until along came "the man from the Alps," Jean-Jacques Rousseau, a small fat Swiss, who, amid the skeptical Voltairean atmosphere, invented the first "back to nature" movement. A vagabond and lackey, he voiced the ideas which produced the French Revolution and overthrew the existing social order; half-starved in a garret, he launched modern ideas of hygiene and education.

The 18th century went out in the horror of the French Revolution. Diderot, editor of the first great French encyclopedia, and Buffon, philosophical naturalist, died before the Revolution. Bernardin de Saint-Pierre survived to produce his once highly popular 'Paul and Virginia'.

The Revolution destroyed a world of formalism and fixed ideas, and raised the curtain on the modern age. The old classical rules of writing were smashed, along with political laws. Writers made new forms, used words in new and vivid ways. This new rebellious trend was known as "romanticism."

The Brilliant "Romanticists"

The acute and cynical Stendhal (Henri Beyle), when reproached for his romanticism, declared he held a lottery ticket for the year 1935. His fame did not delay so long, however. The warmth of Italy that swept through 'La Chartreuse de Parme', and his skilful etching of complicated souls, had genius. Moreover, Stendhal's romances held many elements of realism, just as the poet, Alfred de Vigny, romantic though he was, exhaled the cool breath of classicism.

Balzac and Hugo, Mérimée and Dumas and George Sand, were the true leaders of the romantic movement. The vast stage of living beings of Balzac dwell in a world expressly made for them by Balzac. Hugo found no theme too dramatic, no tale too powerful, for his gifted pen. Mérimée led in the use of "local color," painting an exotic background, as in 'Carmen'. George Sand lost herself in a morass of sentimentality, and Dumas the elder poured forth a flood of lively tales too careless to be great.

The poet Alfred de Musset wrote fervid and impassioned lyrics, and the strange Charles Baudelaire

made great poetry of dark themes. Hugo said he gave the world "a new shiver." Théophile Gautier, who with his fellow romanticists danced derisively around the bust of Racine to celebrate the new times and supported Hugo at the production of his unconventional play 'Hernani', wrote poems, novels, and dramas of flawless excellence.

"Realists" Displace Romanticism

With Gustave Flaubert the new page of realism was turned in French literature. To pigeon-hole writers as "classicists," "romanticists," or "realists" is very artificial; yet it does put a name to some philosophical or emotional change. This growth or transition is recorded by sensitive writers. "Realism" was a reaction against "romanticism."

Flaubert presented life in its true colors—to him, drab. He worked upon his prose, word by word, like a sculptor of gems. His insight into character made

the novel of incident seem trivial. Even more self-consciously realistic, or naturalistic, were the Goncourt brothers, who "wrote with their nerves," took notes on revolting scenes in hospitals to get at the facts.

Dumas, the younger, a more careful workman than his famous father, wrote dramas rebuking a wayward world. He was far exceeded, however, by Emile Zola, leader of the "naturalists," who stirred up turgid social depths. The new "naturalist" school had as its theory that life should be presented without comment or opinion from the author. Just why it should be more natural to view life without opinions than to see it through the veil of one's own thoughts, moods, prejudices, and experiences, it would be difficult for

a modern psychologist to say. And why the only "natural" scenes should be those from the slums, from vice and crime and sorrow, was a puzzle to readers even in the heyday of "naturalism."

Zola's own energetic temperament infused power into his tales of degradation, though his diffuseness, lack of proportion, and far from sculptural composition might well pain a reader of sensitive taste.

More typical of the French genius was Ernest Renan, gentle skeptic, brilliant historian and stylist, as were also Hippolyte Taine, Emile Faguet, and

Ferdinand Brunetière, all critics of distinction.

Anatole France, who recommended irony and pity as the best reply to modern life, has been likened to the great essayist, Montaigne, as having most delicately distilled a certain penetrating, smiling, disbelieving quality in the French spirit. Huysmans, however, was an uncompromising misanthrope, recording his hate of mankind in several volumes before his conversion to religion changed his viewpoint.



STENDHAL
Analyst of Romance



ANATOLE FRANCE
Critic of Life and Letters

All the world of amateur short-story writers has heard of Guy de Maupassant, genius of the short story, who perfected condensation, cold analysis, and the bare, powerful style. Lover of the Orient and of the exotic, master of poetic prose, was Pierre Loti, whose slight plots served as frames to long, delightful travel sketches.



MAUROIS
A New-Style Biographer

Paul Bourget, in his long list of widely read novels, opposed naturalism but borrowed its method, weighting his tale, however, with a heavy moral or sociological thesis. The scientific point of view never yet created art, and the work of Bourget, in spite of keen psychology, lacks authentic warmth.

Determined to present the spirit of France, Maurice Barrès turned abruptly from the pure egoism of his earlier works, such as 'Le Culte du moi', to an almost fanatical belief that "every living being is born of a race, a soil, an atmosphere, and genius manifests itself only in proportion as it is linked with its land and its dead." Barrès was profoundly affected by German philosophy; and so likewise was Henri Bergson, a philosopher, noted for his forceful charming prose. Bergson held that the true nature of things is revealed to us more by intuition than by reasoning. This idea, essentially un-French, has influenced 20th century French writers so widely as to give Bergson literary importance.

American Favorites

An unusual understanding and appreciation of German character appeared in the ten-volume trilogy 'Jean-Christophe', by Romain Rolland, whose freedom from national prejudices naturally won him much harsh criticism. Rolland's masterpiece was as well known outside France as were the plays of his contemporary, Edmond Rostand, whose 'Cyrano de Bergerac' and 'Chantecler' delighted audiences in many lands. The most rapid leap into the American best-seller list, however, was made by Abbé Ernest Dimnet's 'The Art of Thinking'.

Symbolism, which makes its appearance from time to time down the centuries in all literatures, was rediscovered in France and elsewhere toward the end of the 19th century, particularly by the poets. Leader of the symbolists was Henri de Régnier, until he made an abrupt turn back to Greek traditions. Rich in learning, this poet steeped his verse in beautiful imagery, and also turned out prose comparable to that of Anatole France. Quite the opposite of Régnier was Francis Jammes, sometimes called the Whittier of France. Simplicity, love of nature and of

animals, gentle thoughts of periwinkle skies, brought his verses great popularity. His Catholicism was less austere, his poetic fire less brilliant, than that of Paul Claudel, dramatist and poet.

Thoroughly pagan and thoroughly modern was the poetry of the Comtesse de Noailles. A sophisticated mixture of discontented modern and of ancient Greek, she wrote of the rapture of love, the terror of death, of her search for beauty. A similarly pagan, love-lorn trend pervaded the novels of Pierre Louÿs.

Of all modern writers, Marcel Proust most deeply influenced world literature. His literary genius surmounted even the exaggerated praises of his publisher and the Proust cult.

This sensitive neurotic who lived for years in a cork-lined room knew the world more profoundly than the most bustling "man in the street." His thoughts trailed out in a filigree of elaborate sentences. He spread his consciousness out like a mist over the most banal scene, over the most shifting shade of the human soul. He was first and most convincing of writers to recognize that a man is not the same from moment to moment. His series 'A la recherche du temps perdu' constitutes a whole world, a whole literature.

Typical French Intellectuality

As distinguished as Proust, though less famous, was Paul Valéry, who succeeded to the place of Anatole France in the Académie Française. Because of his horror of facility, Valéry's slowly and carefully written volumes make but a thin package. In his work one feels that intelligence, like a keen steel blade, typical of French writing. His deep study of the human spirit, not as a social unit but as a lonely thing, is as fine, in a totally different way, as the slow brooding of Proust. Valéry was induced to publish his works by André Gide, himself a deft writer, whose 'L'Immoraliste' was a shrewd study of the Puritan conscience.

Best known of French war books in America was 'Le Feu' (Under Fire) by Henri Barbusse, who did not surpass his war success. Jean Giraudoux, with 'Lecture pour une ombre', and Henri de Montherlant, with 'Le Songe', produced meritorious books on the war. Montherlant was typical of the younger men who revived the ideal of discipline and self mastery.

Georges Duhamel opposed war in a number of effective short stories. The taint of decay left in Europe by the war was implied in the books of Paul Morand, who had a considerable success in America



VALÉRY
Student of the Human Spirit



PROUST
Autobiographer of a Lifetime

with 'Ouvert la nuit' (Open All Night), as did André Maurois with his very popular 'Ariel: the Life of Shelley'. Jean Richard Bloch's 'Et Cie.' displayed a talent with the flavor of Balzac. He also wrote one of the best recent French plays, 'Le dernier Empereur'. François Mauriac, tortured by a sense of the evil nature of love, wrote bleak, powerful tales untrue to most experience. Jean Cocteau, jaunty boulevardier of talent, had a certain quick success with

poetry, novels, a ballet, and pen-and-ink sketching.

In poetry, novels, essays, and criticism, French literature of the 20th century has compared well with the record of the past; in drama, much less well (see Drama). The conflict of "isms" noted in the 19th century has subsided. Creative minds absorbed the idea that the world reveals itself in different ways to different temperaments, and thus brings about new ways, schools, or styles, of writing.

GREAT FIGURES IN FRENCH LITERATURE

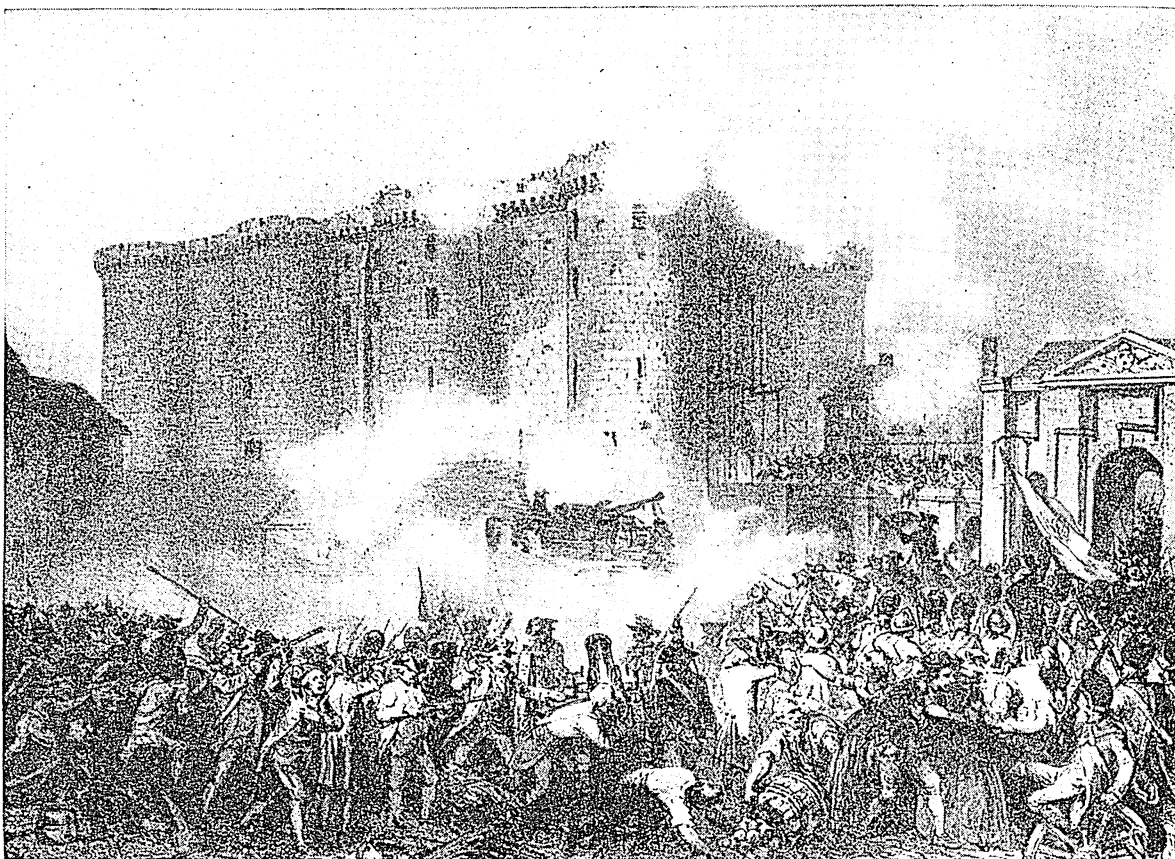
Jean Froissart (1337-1410)—'Chronicles'.
 François Villon (1431-?)—'Petit testament'; 'Grand testament'.
 Clément Marot (1495-1544)—'L'Adolescence'; 'Clémentine'; 'Blasons'; and other poems.
 François Rabelais (1493?-1553)—'Gargantua'; 'Pantagruel'.
 Pierre de Ronsard (1524-1585)—'Odes'.
 Michel Montaigne (1533-1592)—'Essays'.
 François de Malherbe (1555-1628)—Poems; translations.
 Pierre Corneille (1606-1684)—'Médée'; 'Le Cid'; 'Polyeucte'; 'Oedipe'.
 François de la Rochefoucauld (1613-1680)—'Maximes'.
 Jean de la Fontaine (1621-1695)—'Fables'.
 Molière (Jean-Baptiste Poquelin) (1622-1673)—'Tartuffe'; 'Le bourgeois Gentilhomme'; 'Le Malade imaginaire'.
 Blaise Pascal (1623-1662)—'Pensées'.
 Madame de Sévigné (1626-1696)—Letters.
 Nicolas Boileau (1636-1711)—'Épîtres'; 'L'Art poétique'.
 Jean Racine (1639-1699)—'Thébaïde'; 'Andromaque'; 'Bérénice'; 'Iphigénie'; 'Phèdre'; 'Athalie'.
 Jean de la Bruyère (1645-1696)—'Caractères'; 'Mémoires'.
 François de Salignac de la Mothe Fénelon (1651-1715)—'Télémaque'.
 Voltaire (François Marie Arouet) (1694-1778)—'La Henriade'; 'Zaïre'; 'Candide'; 'Dictionnaire philosophique'.
 Georges-Louis le Clerc, Comte de Buffon (1707-1788)—'Histoire naturelle'.
 Jean-Jacques Rousseau (1712-1778)—'La nouvelle Héloïse'; 'Contrat social'; 'Émile'; 'Confessions'.
 Denis Diderot (1713-1784)—'Encyclopédie'.
 Bernardin de Saint-Pierre (1737-1814)—'Paul et Virginie'.
 Madame de Staël (1766-1817)—'Delphine'; 'Corinne'.
 Stendhal (Henri-Marie Beyle) (1783-1842)—'Le Rouge et le Noir'; 'La Chartreuse de Parme'.
 Alfred de Vigny (1797-1863)—'Cinq-Mars'; 'Chatterton'.
 Honoré de Balzac (1799-1850)—'Les Chouans'; 'Eugénie Grandet'; 'Le Père Goriot'; 'La Cousine Bette'.
 Victor Hugo (1802-1885)—'Notre Dame de Paris'; 'Les Misérables'; 'Les Travailleurs de la mer'; 'Hernani'.
 Prosper Mérimée (1803-1870)—'Colomba'; 'Carmen'.
 Alexandre Dumas, the elder (1803-1870)—'Les trois Mousquetaires' (The Three Musketeers); 'Vingt ans après'; 'Monte Cristo'.
 Charles-Augustin Sainte-Beuve (1804-1869)—'Causeries du lundi'.
 George Sand (Baroness Dudevant, née Aurore Dupin) (1804-1876)—'Jacques'; 'Consuelo'; 'La Mare au diable'.
 Alfred de Musset (1810-1857)—'La Confession d'un enfant du siècle'; 'La Nuit de mai'.
 Théophile Gautier (1811-1872)—'Émaux et camées', poems; 'Mademoiselle de Maupin', novel; 'Le Capitaine Fracasse', novel; 'La Morte amoureuse', short story.
 Charles Baudelaire (1821-1867)—'Fleurs du mal', poems; 'Histoires extraordinaires' and other Poe translations.
 Gustave Flaubert (1821-1880)—'Bouvard et Pécuchet'; 'Madame Bovary'; 'Salammbô'.
 Edmond and Jules de Goncourt (1822-1896, 1830-1870)—'Germinie Lacerteux'; 'Madame Gervaisais'.
 Ernest Renan (1823-1892)—'Étude sur les origines du christianisme', which includes 'La Vie de Jésus'.
 Alexandre Dumas, the younger (1824-1895)—'La Dame aux camélias'.

Hippolyte Taine (1828-1893)—'Histoire de la littérature anglaise'; 'Origines de la France contemporaine'.
 Emile Zola (1840-1902)—'Rougon-Macquart' series, including 'L'Assommoir'; 'La Bête humaine'; 'La Débâcle'.
 François Coppée (1842-1908)—'Le Reliquaire', poem; 'Le Passant', play; 'Contes', short stories.
 Paul Verlaine (1844-1896)—'Fêtes galantes'; 'La bonne Chanson'; 'Sagesse'; 'Romances sans paroles'.
 Anatole France (Jacques Anatole Thibault) (1844-1924)—'L'Île des pingouins'; 'L'Étui de nacre'; 'Thais'; 'L'Histoire contemporaine' series, including 'L'Orme du mail'; 'Le Mannequin d'osier'; 'L'Anneau d'améthyste'; 'M. Bergeret à Paris'.
 Émile Faguet (1847-1916)—'Notes sur le théâtre contemporain'.
 Joris Karl Huysmans (1848-1907)—'En ménage'; 'Là-bas'; 'La Cathédrale'.
 Ferdinand Brunetière (1849-1906)—'Histoire de la littérature française classique'.
 Georges de Porto-Riche (1849-1930)—'La Chance de Françoise'; 'L'Infidèle'; 'Amoureuse'; 'Le Passé'.
 Guy de Maupassant (1850-1893)—'La Ficelle' (The Piece of String); 'La Parure' (The Necklace); 'Une Vie' (A Life).
 Pierre Loti (Louis Marie Julien Viaud) (1850-1923)—'Le Pêcheur d'Islande'; 'Madame Chrysanthème'.
 Paul Bourget (1852-1935)—'Le Disciple'; 'L'Émigré'; 'Un Divorce'; 'La Duchesse bleue'; 'Cruelle énigme'.
 Henri Bergson (1859-1941)—'L'Évolution créatrice'; 'Matière et mémoire'.
 Maurice Barrès (1862-1923)—'Le Culte du moi'; 'Les Déracinés'; 'Les Bastions de l'est'; 'Colette Baudoche'; 'Le Jardin sur l'Oronte'; 'La Colline inspirée'.
 Henri de Régnier (1864-1936)—'Tel qu'en songe'; 'La Sandale ailée'; 'Le Miroir des heures', poems; 'La Double Maîtresse', novel; 'La Peur de l'amour', story.
 Romain Rolland (1866-)—'Jean-Christophe'; 'Colas Breugnot'; 'Gandhi'; 'Les Caves du Vatican'.
 Charles Maurras (1868-)—'L'Étang de Berre'.
 Francis Jammes (1868-1938)—'Quatorze prières'; 'Le Roman du lièvre'; 'Pomme d'annis'.
 Edmond Rostand (1869-1918)—'Cyrano de Bergerac'; 'L'Aiglon'; 'Chantecler'.
 André Gide (1869-)—'Nourritures terrestres'; 'Si le grain ne meurt pas'; 'L'Immoraliste'.
 Abbé Ernest Dimnet (1869-)—'Les Soeurs Brontë'; 'The Art of Thinking'.
 Pierre Louÿs (1870-1925)—'Les Chansons de Bilitis'; 'Aphrodite'; 'Les Aventures du Roi Pausole'.
 Marcel Proust (1871-1922)—'À la recherche du temps perdu' series, including 'Du côté de chez Swann'; 'À l'ombre des jeunes filles en fleurs'; 'Le Côté de Guermantes'; 'Sodomie et Gomorrhe'; 'La Prisonnière'.
 Paul Valéry (1872-)—'La Jeune Parque'; 'Odes'; 'Fragments du Narcisse', poems; 'Variété', essays.
 Henri Barbusse (1874-1935)—'Le Feu' (Under Fire).
 Anna-Elisabeth de Noailles (1876-1933)—'La Nouvelle Espérance'; 'L'Honneur de souffrir'; 'Le Cœur innombrable'; 'Les Innocentes, ou la sagesse des femmes'.
 Jean Giraudoux (1882-)—'Juliette au pays des hommes'; 'Bella'; 'Lecture pour une ombre'; 'Siegfried', play.
 Jean Richard Bloch (1884-)—'Et Cie.' (& Co.); 'La Nuit kurde'; 'Le dernier Empereur'.

Georges Duhamel (Denis Thévenin) (1884-)—*'Lettres au Patagon'; 'Les Hommes abandonnés'; 'Deux Hommes'.*
 François Mauriac (1885-)—*'L'Enfant chargé de chaînes'; 'Le Baiser au lèpreux'; 'Génétrix'.*
 André Maurois (Emile Herzog) (1885-)—*'Ariel: The Life of Shelley'; 'Les Silences du Colonel Bramble'; 'Climats' (The Atmosphere of Love).*

Paul Morand (1888-)—*'Tendres Stocks'; 'Ouvert la nuit' (Open All Night); 'L'Europe galante'.*
 Jean Cocteau (1891-)—*'Plain-Chant', a poem; 'Les Mariés de la tour Eiffel', a ballet; 'Enfants terribles', 'Le grand Écart', 'Thomas, l'imposteur', novels.*
 Henri de Montherlant (1896-)—*'Les Bestiaires'; 'Les onze devant la porte dorée'; 'Le Songe'.*

The FIGHT for "LIBERTY, EQUALITY, FRATERNITY"



Here we see the Paris mob storming the Bastille, the old prison which represented royal oppression at its worst. This dramatic event, which took place at about five o'clock in the afternoon of July 14, 1789, at once made it apparent to all that the old order had fallen. The prisoners were set free, many of the defenders were massacred, and a few days later the fortress was demolished. The Bastille was originally one of the fortified gates of the medieval city of Paris. The great fortress was built about 1369.

FRENCH REVOLUTION. When the French people overthrew their ancient government in the last decade of the 18th century, they adopted as their watchword the famous phrase "*Liberté, Égalité, Fraternité*"—Liberty, Equality, Fraternity. Of the three, "Equality"—the abolition of privilege—was to the French revolutionist the most important. For it he was ready to sacrifice political "Liberty," as he did when he accepted the yoke of Napoleon. For it "Fraternity," or brotherhood with all men, was allowed to remain a beautiful unfulfilled dream. But "Equality" before the law was achieved then and has ever since been maintained.

The Frenchman had a reason for his passionate devotion to equality. Before 1789 inequality was the characteristic of the old régime. Inequalities met one

at every turn and hampered all progress. The nobles and clergy, the "privileged orders," were exempt from such direct taxes as the *taille* and the chief burden fell upon the "Third Estate"—the peasants, artisans, merchants, professional men, etc. Even among these taxes were not equal. Some provinces were exempt from certain taxes, as the *gabelle* or salt tax. Then, too, the collection of certain taxes was done by contractors or tax farmers, and the tax-gatherer collected whatever he could. And woe to the man who seemed prosperous! As a result the peasant lived in a hovel and concealed his resources.

There were social and economic inequalities as well as political ones. The peasant groaned under the remnants of outgrown feudal dues, which were being collected with renewed vigor by the nobles in the

THE ROYAL PRISONERS IN THE TEMPLE



When Louis XVI was arrested by the Revolutionists he was lodged in the prison known as the Temple. Here we see him asleep on a couch. The Queen, Marie Antoinette, is by his side. Standing over the table is Marie Thérèse Charlotte, daughter of the King and Queen, and sitting by the footstool is the little Dauphin, the heir to the throne. Facing him is the King's sister. Beyond the doorway we catch a glimpse of the Revolutionary guards.

latter part of the 18th century. The rabbits might destroy the peasants' garden and the pigeons eat his grain, but he must not kill them, for they were protected for the lord's hunting. His fences were broken down and his crops trampled in the chase, but the peasant could claim no damages. On top of the dues to king and noble came the dues to the church. These and other obligations were often more irritating than burdensome; they were senseless and unreasonable to an age that was coming to believe through the writings of Voltaire and others in the rule of reason.

But were these conditions any worse in the latter part of the 18th century than they had been before? No, nor were they as bad in France as in some other parts of Europe; but now the people were beginning to think. The writers of the time—Montesquieu, Rousseau, Diderot, and the other "Encyclopedists"—stirred up thought and discontent. (See French Language and Literature).

At last the day of reckoning came. The funds in the national treasury had been exhausted by the costly wars of Louis XIV, and by the extravagance of him and his successors. The \$250,000,000 that the American Revolution cost France was the last straw. Turgot and Necker, as ministers of finance, had tried to save the state from bankruptcy by cutting down the expenses of the court. But the court, led by the sprightly, frivolous, and extravagant queen, Marie Antoinette, would not listen to the word "economy."

These ministers were dismissed and more accommodating ones took their place. Loans were tried, but in the end the foreign bankers refused to lend more money. Public opinion was deeply stirred by the Parlement of Paris, a judicial body which defied the king and refused to register new edicts of taxation.

In 1788 Louis XVI, as a last resort, called a meeting of the Estates-General (see Estates-General). The representatives of the three estates,—nobles, clergy, and common people,—all came to Versailles, not far from Paris, early in May 1789, armed with memorials (*cahiers*) demanding reforms. The grievances named differed, but all demanded a constitution.

With the meeting of the Estates-General on May 5, 1789, the Revolution began. The representatives of the Third Estate led the way. Some of the nobles and many of the clergy joined with them. They changed the name of the gathering from "Estates-General," which represented classes, to "National Assembly," which represented the people of France. When the king shut them out from their usual place of meeting, they took the famous "Oath of the Tennis Court" (June 20, 1789), pledging themselves not to separate until they had given France a constitution. When the king sent a messenger to remove them from their hall, the fiery Mirabeau cried out: "Go tell your master that we are here by the will of the people and that we will be removed only at the point of the bayonet." Such boldness was portentous.

Paris, 14 miles away, was alarmed by rumors of the gathering troops about Versailles. A Paris mob stormed and captured the old royal prison in Paris, called the Bastille, on July 14. Here for generations kings and ministers had imprisoned men and women at will. Soon after, its thick walls were demolished as a symbol of the overthrow of despotism, and the date of its capture became the French national holiday. When the king in Versailles was informed of what had taken place he exclaimed: "Why, this is a revolt!" "No, sire," was the reply, "it is a revolution."

After the fall of the Bastille a revolutionary committee of middle-class citizens governed Paris. A national guard composed mainly of citizens was organized and placed under the command of General Lafayette. Then the provinces followed the lead of Paris and formed revolutionary governments. The peasants in many places burned the castles of the lords, in order to destroy the papers which contained the records of the lords' manorial rights. "Spontaneous anarchy" prevailed in many country districts.

Nobles Renounce Their "Privileges"

A report of the peasant outbreaks made a wonderful impression on the Assembly. Some liberal nobles in that body set the example of renouncing their feudal rights. Amid the wildest enthusiasm, men weeping and embracing each other, one noble after another gave up some exclusive privilege, until finally a decree was passed which aimed at abolishing the feudal system entire. That wild night of Aug. 4, 1789, saw the beginning of Equality, though remnants of feudal dues kept the peasants uneasy until 1793.

But what had become of the constitution which the Assembly had promised to France? Work on it progressed piecemeal, and it was finally finished in 1791. Nobility was abolished. France was made a limited monarchy, with a one-house legislature. The immortal part of the document was the "Declaration of the Rights of Man." It included the following points:

1. All men were born free with equal rights.
2. All citizens have the right to take part in electing representatives to make the laws.
3. Every person shall be free to speak, write, or print his opinions provided he does not abuse this privilege.
4. The amount of taxes which a person is called upon to pay shall be based on the amount of wealth that he possesses.

The Declaration of the Rights of Man came to be regarded as the charter of democracy. The equality of all men in the eyes of the law is its essence. Property was inviolable, for the chief supporters of the new order held property or desired to hold it.

Overthrow of the Monarchy

If the king had possessed the courage—the moral backbone—and the vision to put himself at the head of the movement, France might be a monarchy today. But he was only a well-intentioned blunderer. At first he did promise to obey the constitution of 1791, which placed a narrow limit on his power. But then

he listened to evil counselors. Many nobles had fled before the storm. These *émigrés*, as they were called later headed by his own brothers, were in Germany, Austria, and Switzerland, appealing to the princes of Europe to stop the Revolution in France, and threatening a reign of bloodshed when they returned. The people of France, apparently with good reason, mistrusted the king and still more Marie Antoinette, "the Austrian woman." In October 1789, a disorderly mob of women and men had brought them—and the Assembly with them—from Versailles to Paris, that they might be more closely watched. The suspicions against them were changed into certainties for most of the people, in June 1791, when the king and queen with their children sought escape in flight. They were captured at Varennes, on the edge of the Argonne, just before they reached the border of France. They were brought back to Paris, and from that day the monarchy was doomed.

These events hastened the division of the revolutionists into two parties, the constitutional royalists and the republicans. The new Legislative Assembly, which met as soon as the king had accepted the constitution (September 1791), still wanted to preserve the monarchy. But the republican sentiment increased rapidly as the king's weakness became more apparent.

On Aug. 10, 1792, a mob invaded the Tuileries, killed the guards, and forced the royal family to seek refuge in the hall of the Legislative Assembly. On Sept. 21, 1792, a decree was passed that "royalty is abolished in France," and a republic was proclaimed. Four months later Louis XVI was sent to the guillotine, a beheading machine named for the physician whose recommendation brought it into use.

The Clergy Oppose the Revolution

The overthrow of the monarchy was not entirely due to the weakness of the king. Affairs generally in France seemed to be going from bad to worse. The clergy and many devout Catholics had withdrawn their support from the Revolution because of the laws against the church. First of all, the church property had been taken by the state; this was a financial measure and generally approved. Then the "Civil Constitution of the Clergy" was drawn up, according to which all clergy from bishops to parish priests were to be elected and all must take an oath to support the government. The lower clergy drew back, and only four bishops took the oath. By a blunder the Assembly had divided the patriots, who had supported all changes up to this point. Others, especially merchants and tradesmen, were irritated by the paper money (*assignats*) with which the country was flooded and which soon became worthless. Royalist uprisings were occurring in some provinces, as in the Vendée. And at the same time that these dangers were threatening the Revolution within the country, Austria and Prussia, having finished the partition of Poland, were allied and hostile to the new order in France which threatened the old order everywhere in Europe. England was drawn into the war when the

THE ARISTOCRATS AND THE MOB IN THE STREETS OF PARIS



This picture illustrates a scene which was often repeated at the beginning of the Revolution. An aged member of the aristocracy, with his daughter on his arm, is being hooted and jeered by the maddened populace.

French revolutionary armies occupied the Austrian Netherlands (Belgium).

To guide the Revolution through this crisis a strong government was needed, and for this reason the people of France sacrificed liberty. A "Convention" was called to draw up a new constitution, and for three years (1792-1795) a committee of this assembly, known as the Committee of Public Safety, ruled France with an iron hand, while the constitution remained safely shut up in a box. The power of this committee did not come from the convention, but from the radical Jacobin club, whose members in the convention were known as the Mountain, from the high seats which they occupied in the hall of the Legislative Assembly (*see* Jacobins).

The men of power were Danton, Marat, and Robespierre, until the second was struck down by Charlotte Corday. Through agents and spies and "deputies on mission" the Great Committee spread its net over the whole of the country. By terror it maintained its position, and so the period is known as the Reign of Terror. By its means the royalist uprisings were sternly put down. Hundreds, even thousands, were sent to the guillotine. Marie Antoinette, Madame Roland, aristocrats and tradesmen, atheists like Hébert, finally even Danton himself (because he urged moderation), were executed, usually with no trial or only an imitation of one. Old institutions were changed. The worship of the Goddess of Reason supplanted religious services in the Paris churches. The calendar was made over, 1792 becoming the Year I, the first year of the French Republic, and the names of the months being changed.

But the Terror accomplished that for which it was intended. The Prussian-Austrian invaders had been turned back at Valmy (Sept. 20, 1792). Then the French armies carried the war into the lands of their enemies. "All governments are our enemies," cried an orator of the Convention, "all peoples are our friends." Belgium, Nice, and Savoy were added to France. Under Carnot, who by his efficiency gained the enviable title of "Organizer of Victory," 14 armies were put in the field. The cry had gone up for the natural frontiers of France, and the Revolution at war was going back to the policies of Louis XIV.

The Downfall of Robespierre

At length, however, the enemies of the Revolution at home and abroad seemed to be suppressed. Only Great Britain and Austria continued the war. The people were tired of the Terror, and when Robespierre showed no signs of stopping the bloodshed, the rest of the Convention took matters into their own hands. Danton had predicted, "Robespierre will follow me; I drag down Robespierre"; and finally Robespierre was arrested and sent to the guillotine (July 27, 1794). People then and afterwards blamed him for all the horrors of the Reign of Terror, but much of the blame, as well as the credit for it, belongs to others.

More moderate men now governed France. The Convention made another constitution—the third

formed since 1789, and the second to be put into operation—and then prepared to dissolve. A mob of radicals led by conservatives protested against two-thirds of the new assemblies being drawn from the hated Convention. A young artillery officer, Napoleon Bonaparte, protected the new government. He was practically unknown at that time, but before long his history became the history of France. The new government, the Directory, proved unable to meet the problems within disorganized France. The glory of foreign victories which France won under it was due to Bonaparte. At length, Nov. 9, 1799, he overthrew the Directory. Under the cloak of a Consulate of three members he ruled France until 1804, when he threw off the cloak and became "Napoleon I, Emperor of the French." Liberty was gone. Napoleon himself declared: "Liberty is a necessity felt only by a not very numerous class. It can therefore be restricted with impunity. Equality on the other hand pleases the multitude." (*See* Napoleon I.)

Few events in history have so powerfully influenced the life of modern peoples as did the French Revolution, and on the whole that influence has been a permanent one for good. (*See also* articles on chief revolutionary leaders.)

FRICTION. Every machine or vehicle must overcome the resistance, called *friction*, which results when one body rolls or slides over another. Whenever you pull a sled or turn a crank, you must overcome not only the forces of inertia and gravity, but friction as well (*see* Physics).

This ever-present resistance is caused by the unevenness of surface which we find even in the hardest and best polished objects if we examine them under the magnifying glass. The smoother the surface, the less the friction; hence in machines every effort is made to make the surfaces hard and smooth. Lubricants also lessen friction, and this is why automobiles and other machines are provided with elaborate oiling systems, without which the heat developed by friction would soon ruin them. Furthermore, rolling friction is less than sliding friction. This is why bicycle and automobile wheels and roller skates are provided with ball and roller bearings. Friction is also reduced by bearings made of "antifriction metals"—various soft alloys which are at the same time hard enough to hold their form against pressure (*see* Alloys).

Because friction means resistance, never power, we sometimes regard it as an unmitigated nuisance and a dead loss. Yet a frictionless world would be a strange place. It is friction that enables us to transmit power by pulleys and stop trains by brakes. Without friction, street-car and railroad wheels would spin around without advancing, as they sometimes do when there is ice on the rails, and a thousand and one other forms of effort would be fruitless. Friction in the wrong place, like sand in the bearings, is a dead loss; but in the physical world we would never get anywhere if we didn't encounter resistance—friction—on the way.

LITTLE TALKS ON GREAT THINGS *by Arthur Mee*

FRIENDSHIP



ONE thing we all need on our journey through this world, whatever Time may bring to us. We come into the world alone; we pass out of it alone; but none of us can live his life alone. It is true that there are things in all our lives that God and we alone can know. It is true that there are times in all our lives when God alone can comfort us. It is true that the hour will come when the love of the dearest friend will fail us. But it is true that the love of a friend is the dearest thing in all the world, and that no man is so happy, and no man is so miserable, that he can scorn or reject it. In happiness and sorrow, too, the heart of a friend is our common need.

In the great things that make life worth while the hearts of true friends beat as one. In the journey from this world to the next comrades march together. Deep in the heart is sown the seed of friendship. When the daughter of a captive king bowed in submission before the closest friend of Alexander, thinking him the conqueror, she was much distressed by her mistake. "Do not distress yourself, madam," said the conqueror; "he, too, is Alexander." It was Alexander's beautiful tribute to a friend who was in possession of all Alexander's sympathies. Such friends are towers of strength to us. When our burden is greater than we can bear, they will share it with us. When our life is pleasant and easy, they will increase our happiness.

How Much Friendship May Mean

And the friend we choose in early life, whose life is linked with ours in the days when we are building up our interests, will grow dearer and dearer as the earth rolls through the heavens. The cares of life will knit us closer, and out of our sorrow, if sorrow should come, Time will weave a bond between us that Time itself can never break. Sorrow brings out friends as night brings out stars; and there are no friends truer than those who have shared our griefs, have known our fears, have helped sustain us in all the storms that come.

The friends thou hast, and their adoption tried,
Grapple them to thy soul with hoops of steel.

Shakespeare was right, but we should hold our friends by bonds more enduring than steel, the bond of sacrifice each for each, of perfect reliance upon each other's strength,

of perfect trust in each other's love. Each will give to each the strengthening and uplifting things that all of us need in every hour of mortal life. In perplexity there will be counsel, in fear there will be courage, in all great enterprises there will be wise encouragement to splendid ends. And there will be always the steadying force of friendship, the restraint of wisdom, the love that would be sure that right is right.

The Friend as a Counselor

The wise love of a friend knows when to urge and when to check. It will not surrender great ends for smaller things. It will not determine great issues by small considerations. It will not oppose itself to natural circumstances and natural development, but will seek to guide them wisely and to grow with them. And we, on our part, should welcome the affection that bids us pause, that would be doubly sure before it sees us plunge into some great enterprise.

It is wise to know many people. It is wise to seek the company of those who are interested in the movement of the world. There is not much room in the world for dull people, and there is no room in your mind for ignorant people who will not learn. Pity them and teach them wisdom if you can, but we should seek the inspiration of those who feel that the world is real, that everything about us matters, and that the march of the world depends upon us, under the guiding hand of God. Every year, with expanding vision, we should widen the circle in which we move. It will be no narrow circle. We should shut our minds to nothing that has in it promise of a better future for anything under the sun.

And in this broadening circle, to which we should give of our life payment in abundance for what it gives to us, we may choose a closer circle of friends. Many we may know, but few we shall choose. They will come into our heart, and we shall open the gates of our soul to them. A Greek poet wrote:

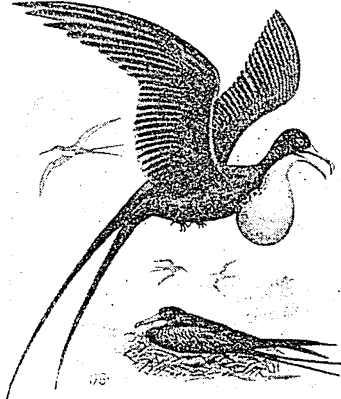
For Death, he taketh all away, but them he
cannot take.

"He taketh all away," but the love your friend bore you, the sweet memory of it will live through Time after Death, with the stars, and the wind on the heath.

FRIGATE-BIRD. The "man-o'-war-bird," as the frigate-bird is sometimes called, is a genuine feathered airplane. Without seeming effort, it floats high in the air for hours at a time, ascending in spirals, or altering its course by so slight a change in the angle of its "planes" that the movement is not apparent.

There are but two species in this unusual family (the *Fregatidae*), both tropical birds. The larger of the two occurs in both hemispheres, mainly north of the Equator, and has been seen rarely as far north

REMARKABLE BIRD OF THE SEA



This picture will help to fix in your mind many striking characteristics of the Frigate-Bird—his huge wings, his forked tail, his curious air sac, his big beak, his ridiculous little legs. The lady Frigate-Bird you see upon her nest.

as Nova Scotia, and inland to Iowa. The other species appears in the Central Pacific and Indian oceans.

Frigate-birds have long, stout, hooked bills; the tail is extremely long and deeply forked; and the bones are of a pneumatic structure that makes the body of the bird lighter than that of any other bird of equal wing size.

When spread, the long narrow wings measure ten feet from tip to tip. But they have very small legs and are almost helpless on land. Perhaps the most striking characteristic is the air sac of the male, which lies along the throat and, when fully distended, reaches outward to the end of the long bill and downward so as to obscure the breast; it then looks like a great red balloon. When deflated the sac is invisible beneath the plumage of the neck. The feathers are black; the female birds, however, have light under-feathers.

These birds nest mainly in colonies on tropical islands. The nest of sticks, placed on rocks or low bushes, contains one or two hen-like white eggs. The birds feed on fish, which they steal from gulls, gannets, and terns. In robbing gannets, frigate-birds display a good deal of strategy. Hiding behind coconut trees they sail out to meet the gannets returning with their fish in the evening. In case the unfortunate fishers do not respond at once to the demands of these feathered pirates, the latter seize them by the tail and give them a vigorous shake. Then down go the fish from their beaks and down swoop the frigate-birds after them. Yet, curiously enough, the birds roost near each other at night as if they were the best of friends.

On islands where they are often disturbed, the frigate-birds build their nests on the edges of inaccessible cliffs, but where they are not molested they

build on the ground. It is about the beginning of January that the males begin the development of that remarkable pouch. A dozen or more will sit on a tree with outstretched and drooping wings, with the great scarlet pouch blown up like a boy's red balloon. When a female frigate-bird approaches the tree, it is considered the proper form to cry "wow-wow-wow-wow" and clatter the beaks like castanets, at the same time shaking the wings. This performance continues throughout the mating season, which extends from January until April. Scientific name, *Fregata aquila*.

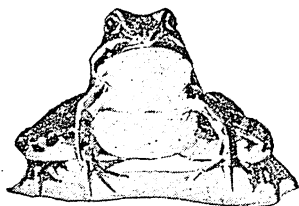
FROEBEL (*frö'bél*), FRIEDRICH WILHELM (1782-1852). It was not until Froebel, the great German educator, was 50 years old that he found his real life-work, the kindergarten, and yet the various occupations to which he gave his youth and manhood were, in a sense, a necessary preparation for it. His uncongenial boyhood home turned his thoughts early to lonesome neglected children. The years which he spent at his uncle's house as apprentice to a forester must have filled his heart early with the love of nature which colors all his thinking. Surveying, clerking, architecture, studying at the University of Jena, gave him the various sorts of experience which helped him to understand all kinds of people.

In his early twenties Froebel was engaged to teach in Herr Gruner's school at Frankfort. He realized immediately that he loved the work, being, as someone has said, "a teacher by the grace of God." He said, in spite of his success, that there was much for him to learn and so he spent several years studying with Pestalozzi, the Swiss educator, and at several German universities. He even volunteered as a soldier against Napoleon, so that he might never ask his pupils to do a thing which he had not done himself.

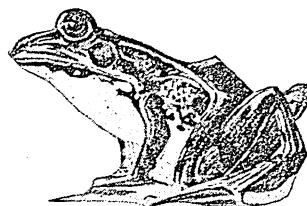
For two years after the Peace of Paris in 1815 he was curator of crystals at the museum of the University of Berlin. That life, however, did not content him, and in 1816 he established his first school. It was not until 1835 that he founded the sort of school that has had so wide an influence on education all over the world. That was the kindergarten—"children's-garden," in English—a school for children between the ages of four and six. The great idea which he developed in his books and in his schools was that children must not be taught by rule, but according to their natural instincts and activities. The kindergarten bases its teachings on play because that is what little children do naturally.

But Froebel did not live to see his idea fully accepted. The Prussian government abolished kindergartens in 1851 because the authorities considered them socialistic. Froebel died the next year considering his life a failure. But, as is often the case with men of new ideas, the teaching which he had thought out lived on. Some of his opinions have been discarded, but his work has still a great influence on education and the establishment of kindergartens all over the world. (See Kindergarten.)

All About FROGS and POLLIWOGS,



The Story of the Little Fish-like Creature that Puts on Four Legs, Absorbs His Tail, Exchanges His Gills for Lungs, and Learns to Live on Land as Well as in the Water



FROG. Frogs are first cousins to toads and second cousins to salamanders. They all belong to the class of backboneed animals known as Amphibia, which means that they are prepared to live both in water and on land. They all have in common a moist clammy skin without scales; all lay their eggs in water, in jelly-like masses; and all pass through a tadpole or polliwog stage.

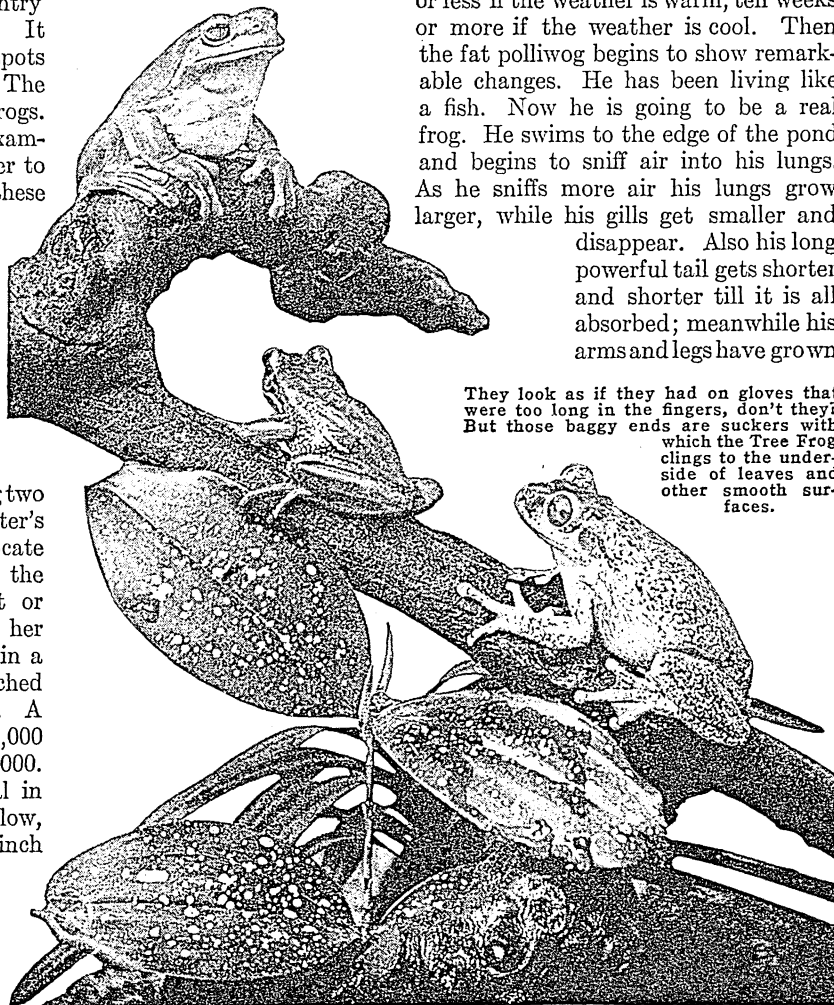
Frogs of one or more kinds are found in all parts of the United States except where it is very hot and dry. The most widely distributed and most abundant is the very common "leopard frog," which is found throughout the country east of the Rocky Mountains. It has irregular rows of black spots all over its back and legs. The under side is light, as in all frogs. We may follow its life as an example of frogs in general, in order to learn many things about these fascinating creatures.

Let us begin at the beginning, and look for the eggs in water a foot or less in depth; in the oozy quiet places at the edges of ponds and small lakes. Here, in March in the south but in April and May farther north, both males and females gather for the annual egg-laying two or three weeks after the winter's ice has thawed. We may locate them by the low croaks of the males. Usually in the night or early morning the female lays her yearly batch of eggs, inclosed in a single mass of jelly and attached to a pond plant of some kind. A small frog may lay 2,000 to 3,000 eggs, a large one 6,000 to 8,000. Each egg is perfectly spherical in shape, black above, light below, and about one-sixteenth of an inch in diameter. When first laid the mass is as large as a teacup, but it swells up with water and has increased in size several times by the time the eggs hatch. It is hard

to believe that so large a mass was all laid by a single mother frog.

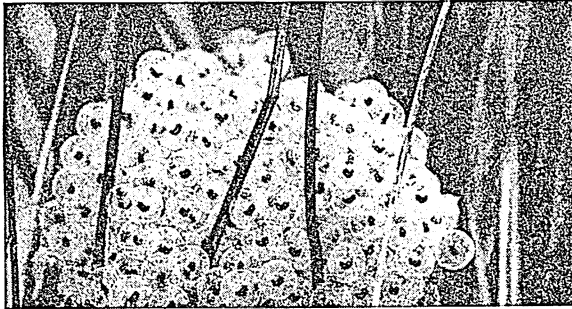
Let us follow one of the eggs. It hatches out into a short stumpy polliwog. A few days later it has grown gills for breathing, a tail for swimming, and a pair of horny beaks, with which it nips off bits of pond vegetation and gobbles up great amounts of mud for the small amount of food it contains. The tadpole is really very much like a fish, with many fishlike characteristics.

So it lives and grows till it is a powerful full-grown tadpole, three or four inches long—in eight weeks or less if the weather is warm, ten weeks or more if the weather is cool. Then the fat polliwog begins to show remarkable changes. He has been living like a fish. Now he is going to be a real frog. He swims to the edge of the pond and begins to sniff air into his lungs. As he sniffs more air his lungs grow larger, while his gills get smaller and disappear. Also his long powerful tail gets shorter and shorter till it is all absorbed; meanwhile his arms and legs have grown



They look as if they had on gloves that were too long in the fingers, don't they? But those baggy ends are suckers with which the Tree Frog clings to the underside of leaves and other smooth surfaces.

THE LIFE OF A FROG FROM THE JELLY EGGS TO THE JUMPING STAGE



The seven pictures on this page are seven chapters in one of the strangest of the romances of Natural History—the "metamorphosis" of a Frog. Beginning as masses of jelly-like eggs attached to pond plants, as shown at the left, the little Polliwogs soon wriggle out into the world, as we see in the picture on the right.

and he is prepared for his life on land. Because of the absorption of the tail, it has been said that a tadpole is "a bottle baby, and cannot lose his bottle until he is through with it."

Many other interesting changes take place in the polliwog, during his "metamorphosis" into a frog. One of the most striking is in the intestine. When the polliwog is fattening himself, his intestine is from two to three feet long so that he can absorb nourishment from the masses of coarse stuff he eats. But when he becomes a small frog, this intestine shortens to two inches. As a frog, he will not need a long intestine, for he will have a nutritious diet consisting of flies, mosquitoes, other insects, and worms.

If the weather is warm, these changes take place within a week or less; if it is cool, they may take two weeks or more.

The young frog is still only about as large as the end joint of a man's finger, but it has all the features of a grown-up frog. It has a smooth moist skin, with spots, and large prominent eyes of great beauty. Back of the eyes are the smooth drumheads of the ears. The mouth has a wide gape, with teeth on the upper jaw and in two small groups on the roof of the mouth. The long tongue is attached at the front end and extends back into the throat. It can be flipped out with great rapidity and precision to catch prey. The arms are small with four fingers on each hand, and the legs are large and powerful with five long webbed toes on each foot.

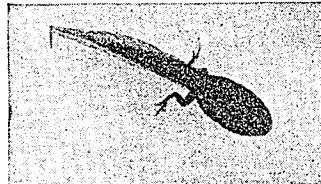
From now on the frog lives in the vegetation of marshy places, always near the water.



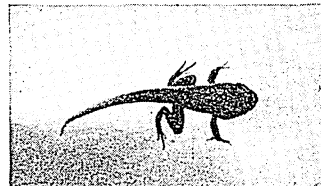
Now the heads have grown larger and the tails longer.



A Polliwog begins to sprout his two hind legs.



Here these feet have already become decidedly froglike.



And now along come a pair of front legs, and he has evidently made up his mind to be a Frog.



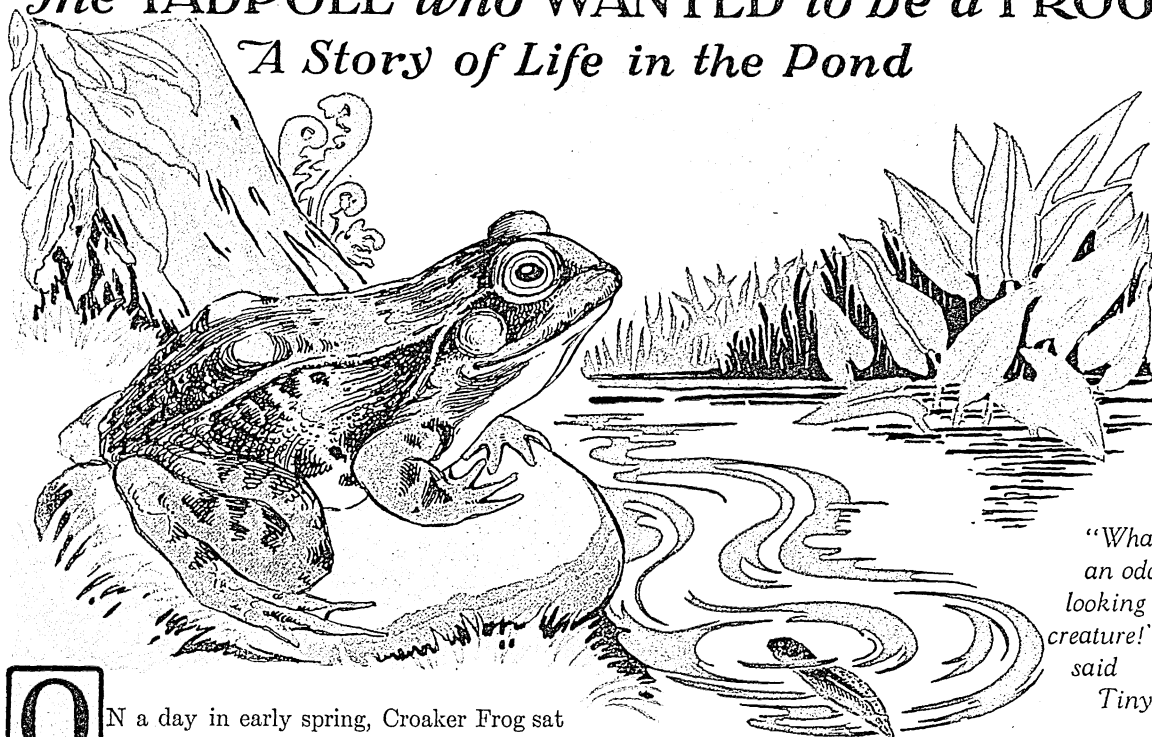
At last the change is complete, the tail has disappeared, and here he sits as if for inspection.

From time to time he may "plunk" into it to escape his enemies. He absorbs water through his skin and stores it in his bladder, to keep his body moist. When the autumn frosts come he must bury himself in oozy places to "hibernate" or pass his long winter sleep. And in the spring the eggs are laid by the female in the water again.

The frog feeds and grows through his first summer, then passes his first winter sleep. The second summer he feeds and grows again, and sleeps again the next winter. He comes out the next spring for the first egg-laying, but he is not full grown till he is about five years or more old. After that how long does he live? No one knows very accurately, but a good many years—perhaps 10 or 20 or 40, if he is lucky enough to escape so long from freezing and drying, and from the snakes and herons and muskrats, and all the other enemies that destroy small frogs and big ones. From the beginning of his life to its end the frog is a wonderfully fascinating creature, and likewise a very useful one. For he captures and gets rid of thousands of mosquitoes and other insects of many kinds that pester man and other animals. Besides, frogs' legs are regarded as a great delicacy for eating. So many bullfrogs are caught for market that they are becoming scarce in some places. Efforts are being made to raise them in enclosed marshes and pools, called frog farms. Frogs are also used for experimental purposes in biological laboratories. To keep the supply from depletion, laws have been passed

The TADPOLE who WANTED to be a FROG

A Story of Life in the Pond



"What an odd looking creature!" said Tiny.

ON a day in early spring, Croaker Frog sat under the drooping branches of a willow tree near the edge of Shady Stream. He was a fine looking young frog, with his coat of green and his white vest. On this spring morning he felt very happy, as he sat there enjoying the feel of the warm air and the sound of the wind in the trees.

All through the long cold days of winter he had slept in the mud at the bottom of Shady Stream. When the first warm wind came down over the hills, and the snow and ice began to melt, he had wakened. He was very glad that spring had come, and very glad indeed to be hopping about once more.

This morning he had hopped up and down the bank of Shady Stream for quite a while. By and by he grew tired, so he sat down on a large flat stone under the willow tree and closed his eyes.

He had not been sitting there long when three little black tadpoles came swimming by. Seeing Croaker Frog, they stopped to look at him.

"Dear me!" said Tiny, the smallest tadpole. "What an odd looking creature! I wonder what it is."

The two other little tadpoles stared at Croaker Frog for a moment. "I don't know," said the second little tadpole. "I don't know at all."

"I don't either," said the third little tadpole.

"Just look how his throat trembles whenever he breathes!" said Tiny Tadpole. "And just look at his long hind legs! What can he ever do with legs like that, I wonder."

Just then Croaker Frog opened his big round eyes so suddenly that two of the little tadpoles were frightened and swam away as fast as they could. But Tiny Tadpole was not frightened. He stayed right where he was and said politely: "Good day, sir! Would you mind telling me who you are?"

Croaker Frog looked down at the little tadpole in the water, and croaked, in his deep voice: "I'm Croaker Frog, and I live here in Shady Stream."

"You do!" Tiny Tadpole said in surprise. "Why, I live here, too, but I never saw you before."

"Have you lived here long?" Croaker Frog asked.

"No, I haven't," Tiny Tadpole answered. "I haven't lived *anywhere* very long, because I'm only a few weeks old."

"Well, I have lived here a long time," Croaker Frog said. "I'm sure I've seen you before. Aren't you a tadpole?"

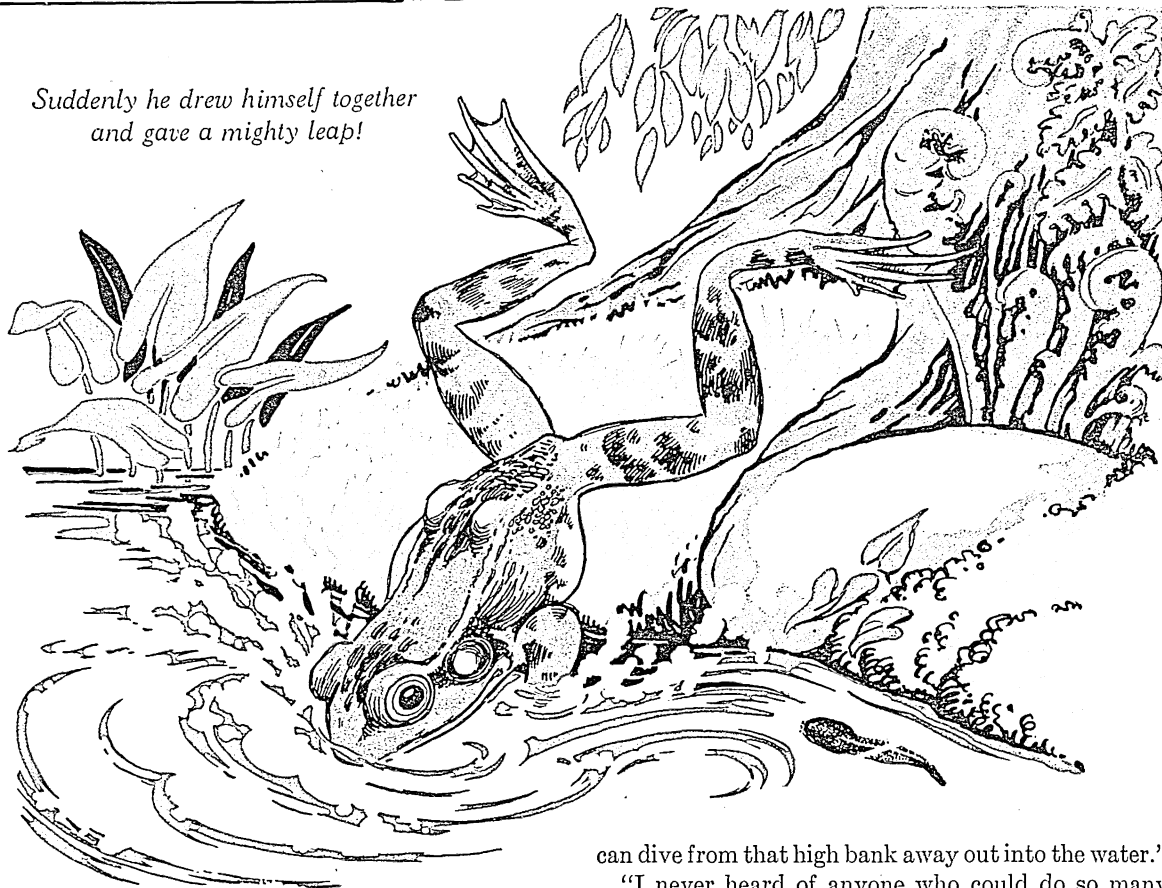
"Yes," Tiny Tadpole answered, "that's what I am. Now, I would like to ask you a question."

"What is it?" said Croaker Frog. "I will answer it if I can."

"I would like to know what you do with your long hind legs," Tiny Tadpole said. "I never saw legs like those in all my life."

"I use them to swim with, and I use them to hop with," Croaker Frog told him. "I can hop very far and very fast," he added proudly.

*Suddenly he drew himself together
and gave a mighty leap!*



"Can you, indeed?" said Tiny Tadpole. "Let's see you do it!"

Croaker Frog hopped along the bank and back again so fast that it almost took the little tadpole's breath. "Mercy!" he said. "I wish I could do that. What else can you do?"

"Well, for one thing," Croaker Frog said, "I can sing, because I am a male frog. Female frogs can't sing. I often sit here in the evening and sing with the other frogs."

"And what else can you do?" Tiny Tadpole asked eagerly.

"I can catch flies and gnats with my tongue," said Croaker Frog, swelling out his sides proudly. "Look!"

He shot out his long notched tongue and caught a fly which was buzzing by.

"Did you see that?" he asked proudly. "Did you see my tongue shoot out? Did you notice that it is hinged at the front end, so I can make it go 'way, 'way out?"

"Indeed, I did," answered Tiny Tadpole. "I wish I could do that. The only thing I do is swim."

"I can swim too," Croaker Frog replied, "and I

can dive from that high bank away out into the water."

"I never heard of anyone who could do so many things!" exclaimed Tiny Tadpole. "But I don't understand about diving. How do you do it?"

"I can't tell you very well," said Croaker Frog, "but I can show you. Would you like to see me dive?"

"Of course I would," said Tiny Tadpole. "I want to find out how it is done."

Croaker Frog hopped up the steep bank. When he had reached the top he sat for a moment, high above Shady Stream. Tiny Tadpole watched him closely.

Suddenly Croaker Frog drew himself together and gave a mighty leap!

Out through the air he went, his long hind legs spread far apart! Tiny Tadpole, looking up at him as he passed high overhead, gave a little wiggle of excitement. "Dear me!" he said. "That's almost like flying!"

Splash! Croaker Frog landed in the middle of Shady Stream, sending up a great spray of water all around him. He made such large waves that the little tadpole was almost washed out on the bank.

"Goodness gracious me!" said Tiny Tadpole. "That was the most wonderful thing I ever saw!"

"It was a fine dive, wasn't it?" said Old Turtle, who came swimming lazily along. "Young Croaker Frog is a splendid jumper."

"I do wish I could jump like that," Tiny Tadpole said.

"Do you?" Old Turtle asked blinking his eyes slowly.

"Yes, I do," Tiny Tadpole answered. "I wish I could jump the way Croaker Frog does. I wish I could hop about on the bank. I wish I could catch flies with my tongue. I wish I could sing. I'm just a little tadpole. I can't do anything but swim."

"Well, now, I wouldn't feel too bad about it if I were you," Old Turtle said kindly. "Maybe some day you can do all these things too."

"What do you mean, Old Turtle?" Tiny Tadpole asked eagerly. "Do you really think I will be able to?"

"I shouldn't wonder," said the turtle. "I'll tell you what; suppose you come with me for a little swim. I think I can show you something that will surprise you very much."

"Let's go right away!" cried Tiny Tadpole.

"All right," answered Old Turtle. "Come along!"

They swam slowly away, down—down—down, to the very bottom of Shady Stream. Old Turtle stopped beside the roots of some water weeds.

"Look around you, young Tadpole," he said, "tell me what you see."

"I don't see anything," said Tiny Tadpole, "except a lot of little tadpoles."

"Do you see anything queer about them?" Old Turtle asked.

Tiny Tadpole looked at them closely. "Why, they haven't any eyes or any mouths, have they, Old Turtle?"

"No," answered Old Turtle, "they haven't."

"But how do they eat?" Tiny Tadpole asked in surprise.

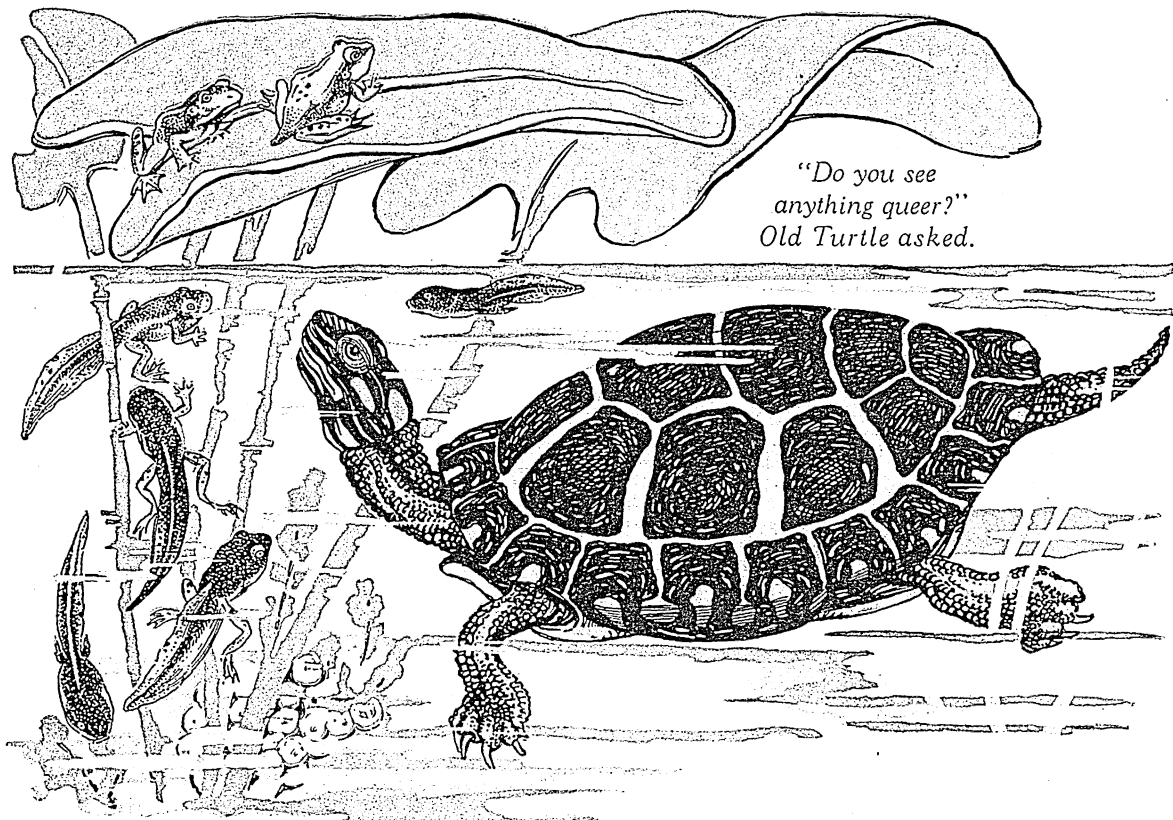
"They don't eat. They aren't hungry, so they don't eat. They just lie here at the bottom of Shady Stream and wait. But in a day or two their eyes and mouths will grow—just as yours did."

"What! Didn't I have any eyes or mouth at first?" Tiny Tadpole asked.

"No, you had no eyes and no mouth. You came out of an egg, you know, just as all little tadpoles do, and at first you didn't do anything. You lay here on the bottom of Shady Stream and just waited, like these little fellows."

"Did I?" asked Tiny Tadpole. "I've forgotten all about it. Isn't that strange!"

"Yes, it is," said Old Turtle, "but something even stranger than that is going to happen to you soon, young Tadpole."



"What is it? What is it?" Tiny Tadpole said, wiggling his little tail very fast. "Please tell me quick, Old Turtle!"

"I will show you what is going to happen to you if you will come with me," answered the turtle, and he swam away.

Tiny Tadpole swam after him as fast as he could, and presently the turtle stopped again.

"Now tell me what you see," he said.

Tiny Tadpole looked around him. There, among the pickerel weeds, were the oddest little creatures he had ever seen. He stared at them for a moment without speaking. "Why," he said at last, "you are tadpoles, aren't you?"

"I suppose we are," one of the odd little creatures answered. "At least we *were* tadpoles only a few days ago. But see what is happening to us now! It is something very strange; something we don't understand at all. Look at us closely. See! Each one of us is growing a pair of hind legs!"

"So you are!" cried Tiny Tadpole. "Why are you doing that?"

"I'm sure I don't know," the little creature said slowly. "Do you know, Old Turtle?"

"Yes," said Old Turtle, "I know why you are growing hind legs; you are turning into frogs, that's why. Pretty soon your front legs will grow too, and then you will lose your tails."

"Lose our tails!" cried the little creature. "Won't it hurt?"

"Not a bit," said Old Turtle. "They will just get a little shorter and a little shorter each day, and then you will be frogs and can hop and dive and swim."

"Oh!" cried Tiny Tadpole. "How wonderful! I wish I could be a frog."

"You will, because you are a tadpole," Old Turtle said. "One of these days, you, too, will lose your tail and your legs will grow. Then you will be just like Croaker Frog."

"Will I?" asked Tiny Tadpole eagerly. "And will I be able to hop very far and very fast?"

"Yes," Old Turtle told him.

"And will I be able to dive?"

"Yes, you will do that too."

Tiny Tadpole swam very close to Old Turtle. "And will I be able to *sing*?" he asked anxiously.

"Yes," Old Turtle said, "of course you will."

"Oh! Oh! Oh!" Tiny Tadpole wiggled all of his little body. "Do little tadpoles always turn into frogs? Do they, Turtle?"

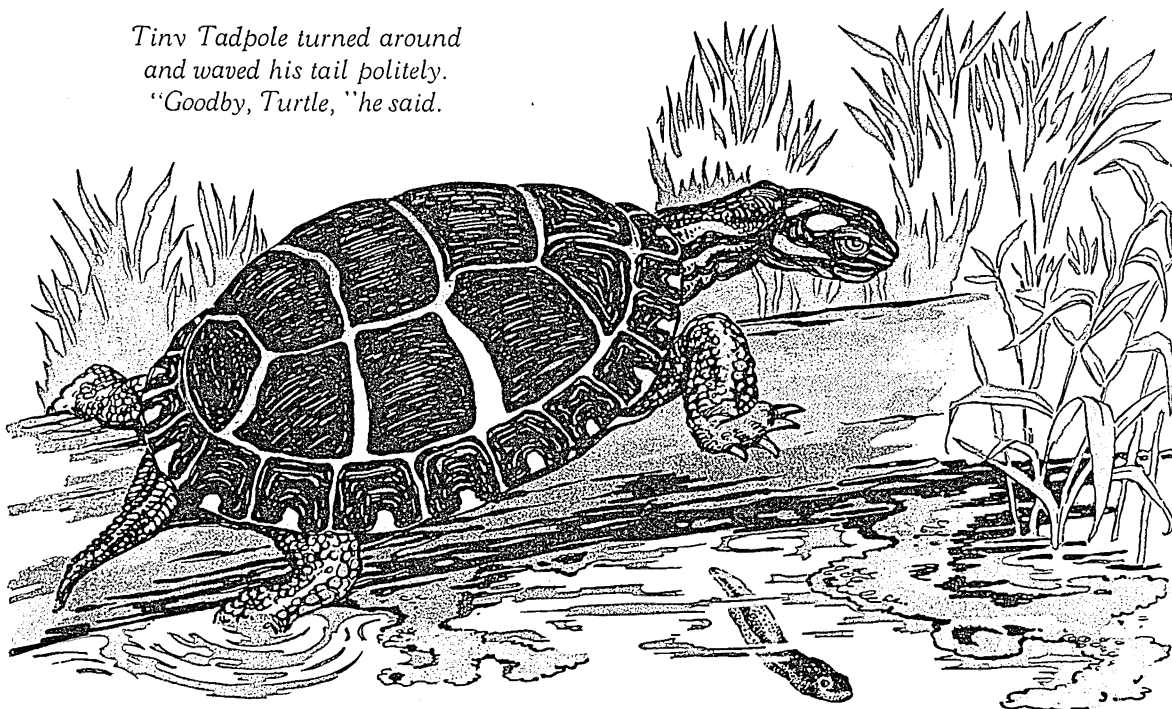
"Yes," Old Turtle answered.

"Well, that is the very most wonderful thing I ever heard," Tiny Tadpole said. "I am going right now to tell all the other little tadpoles."

Tiny Tadpole turned around and waved his tail politely. "Goodby, Turtle; and thank you very much for telling me," he said.

"Goodby," said Old Turtle, and swimming to the bank of Shady Stream he climbed out on a log and went sound asleep.

*Tiny Tadpole turned around
and waved his tail politely.
"Goodby, Turtle," he said.*



making it illegal to catch frogs for market during their breeding season.

Different Kinds of Frogs

There are about three dozen kinds of frogs in this country, differing from the "leopard frog" mostly in mode of life, size, and the spotting of the skin. Of course we all know the tiny "peepers," not so large as the end joint of a small finger, with their shrill songs about the ponds as soon as the ice is out in the spring. Their tiny eggs are laid at very much the same times and places as those of the leopard frog. And the "tree-frog" is also interesting, with its rather doleful song, and its wonderful changes of color—light ashy gray, brown, bright green—in close imitations of its surroundings. Its eggs are laid in late spring. At the other extreme is the great southern "bullfrog," as large as a double fist, with its hoarse drumming sound that can be heard for a half-mile, from which it gets its name. It passes its first winter as a tadpole, as does also the smaller "green frog."

The frogs west of the Rocky Mountains belong to different species from those east of the Rockies but are not very unlike them. In tropical regions some of the frogs lay their eggs in damp places, and the young are liberated as small frogs.

Frogs and toads belong to the order *Salientia*, of the class *Amphibia*. Scientific name of the leopard frog, *Rana pipiens*; of green frog, *Rana clamitans*; of bullfrog, *Rana catesbiana*; of "peeper," *Hyla pickeringii*; of tree frog, *Hyla versicolor*. (See also Toad.)

FROISSART (*frwä-sär*'), JEAN (1337-1410?). As a historian and poet of the Middle Ages, Froissart evidently felt, long before Shakespeare lived to say it, that "all the world's a stage." He lived at a time when that stage was particularly lively, when the curtain rose on great castles and tall cathedrals, when armored knights on strong war horses trod the earth, and chivalry and poetry were in the air.

Froissart gloried in this life, in its gorgeous pictures and heroic deeds. He sang of it in poetic ballads, and he wrote a history, his famous 'Chronicles', dealing with events from 1326 to 1400, which gives us our most vivid accounts of the superstitious, romantic, warring world of that time. It is from him especially that we get our account of the Hundred Years' War, with its picturesque battles of Crécy and Poitiers. Often his stories contradict one another, and there is no doubt that his imagination filled in the barren spots where facts were wanting. He never let uncertainty spoil a good story and his sympathies are always with the lordly knights rather than the humble townsmen and peasants. But his 'Chronicles' are faithful to the spirit and pageantry of those days, even though he was sometimes mistaken about just what happened.

To collect the stories which he tells us, he wandered on horseback, a greyhound trotting behind, through many lands. The queen of England, wife of Edward III, the Scottish King David Bruce and the Earl of Douglas, the Duke of Clarence in Italy, the Duke of Brabant and the Comte de Blois were all among his

friends and patrons. During his travels he talked with lords and knights, squires and heralds, and jotted down from their unreliable lips tales of the court and the battlefield. In his youth he was educated for the church, and in his old age the Comte de Blois made him canon of Chimay; and there was ended the adventurous life of this "knight errant of history." (See Hundred Years' War.)

FRONTENAC (*frôn'ti-näk*), COUNT LOUIS DE (1620-1698). The "Savior of New France" is the title often given to this French nobleman, because it was his efforts that saved the French settlers in the St. Lawrence valley from being wiped out by the Indians. He thus shares with Champlain and La Salle the glory of establishing French power in North America.

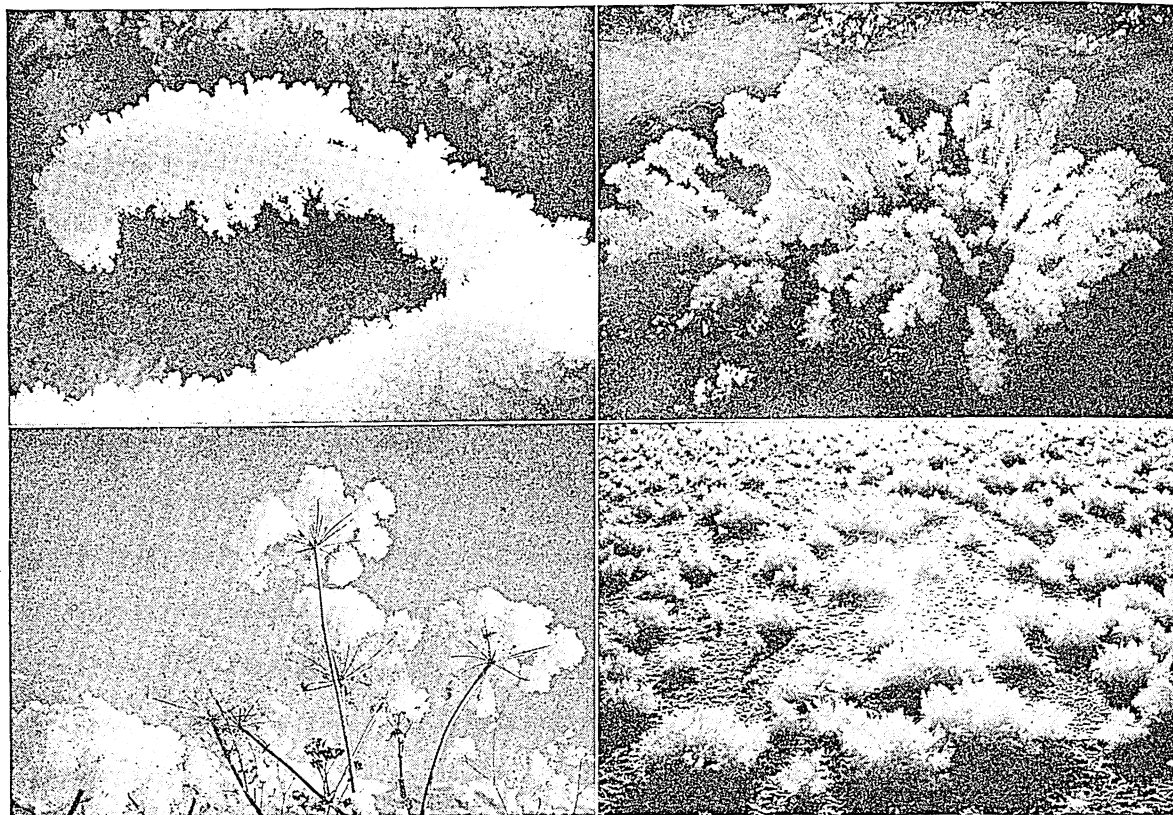
Frontenac belonged to the nobility of France, and had for his godfather King Louis XIII, whose name he bore. The change from the splendid court of France to the wilderness of Canada, to which Frontenac was sent as governor in 1672, was a tremendous one, but he had a passionate love for the soldier's life. As a boy of 15 he had served in Holland, and in the 37 years which had passed since then he had frequently fought valiantly for his king in Italy, Flanders, and Germany.

Furthermore Frontenac liked to rule, and it was a vast domain which was given to him to govern. He showed his administrative wisdom by attempting to introduce into Canada an assembly of nobles, clergy, and common people, like the Estates-General which had met in France in former times. He likewise tried to give Quebec some measure of local self-government by calling town meetings twice a year to elect aldermen and to discuss public business. But while he was trying to introduce these reforms in the New World, the king was busily engaged in suppressing the same institutions in France, and so Frontenac's efforts did not meet with royal approval.

The governor also antagonized many of the leaders in the colony by his imperious and haughty disposition. The traders, however, were friendly, because he crushed the Iroquois Indians, the persistent enemies of the French. The story of his struggles and achievements is told in Parkman's 'Count Frontenac and New France' and Le Sueur's 'Count Frontenac'. Because of difficulties with the Jesuits and others, he was recalled to France in 1692. When the colony was involved in a new war between France and England (1689) he was sent back as governor. This time he not merely defended Canada against English attacks, but so lessened the power of the Iroquois that they never again became a serious danger to the French settlements.

FROST. When you wake up on a fine cold winter morning and find your window-pane covered with wonderful landscapes, flowers, or fairy lace, you know that Jack Frost had been there in the night. He paid visits to the garden and lawn much earlier. In the autumn you found grass, shrubs, and trees silvered

FOUR MASTERPIECES BY THE ARTIST, JACK FROST



Nothing that human artists and craftsmen can do quite equals the infinite skill of Jack Frost in working out his delicate artistry. A whole book could be filled with different examples of frost traceries on window panes alone, and no two would be exactly alike. In this group the first picture shows what are known as "ice-flowers," star-shaped crystals imbedded in masses of ice. The second and third show frost formations on grasses in the field, and the fourth on grasses in a shallow stream. These designs are most beautiful shortly after sunrise; then in a few hours, under the sun's rays, they vanish like some fairy vision.

with frost after some cold, still night. If the conditions were right, little twigs bore a delicate fur of fine white frost. Then, when the sun rose, the chrysanthemums and hollyhocks drooped and withered.

What we have been talking about is "window frost," "white frost," or "hoar frost"—really water crystals, essentially like snow and ice. When the air is ready to form dew, that is, when it is calm and saturated with moisture or water vapor, then, if the temperature falls below freezing, frost or crystallized water is formed instead of dew or liquid water. If the air in a room is dry, frost will not form on the windowpanes no matter how cold it is; but boil a kettle of water in the room or bring a number of people in to fill the air with moisture-laden breath, and at once frost patterns will form on the glass provided it remains cold. Stillness of the air is also essential; you never saw frost after a windy night.

Sometimes the air is too dry or too windy for hoar frost; but the temperature falls below 32° F. and plants freeze at night and turn black when the sun melts the sap in the morning. This is what is known as a "black frost," though it might more properly be called a freeze. We commonly apply the name "frost," however, rather loosely both to the crystalline

deposits of water and to the temperature which produces them.

Frosts are matters of particular concern to farmers because early autumn frosts might kill crops before harvests, and late spring frosts often kill planted crops and fruit buds. Various methods of protection have been devised. A light cloth canopy over plants prevents radiation of their heat into the air, and reflects back the heat from the soil. On still nights a fire which produces an abundance of smoke is useful. The smoke spreads in all directions and acts in the same way as the cloth canopy.

It is a matter of common knowledge that crops on hillsides often escape frost while crops in the adjacent valley are destroyed. This is not caused, however, by cold air "flowing down hill" into the valley, as commonly supposed. All the air cools and becomes denser and heavier after nightfall. The air in the valley, since it is already as low as it can get, remains in position and becomes colder and colder. The air on the hillsides falls a little because of its weight, and then "slides out" over the surface of the bottom air, as though over the surface of a lake, and warmer air from above settles into its place. Thus the temperatures on the hillside are kept higher than in the valley.



This Orange Grove in California Shows How Lavishly Nature Rewards Careful Cultivation of Fruit

FRUITS AND FRUIT GROWING. The fruits that we enjoy today in all their wonderful variety of choice flavors and attractive colors represent nature's gracious rewards for cultivation rather than her free gifts to man. Primitive man took what wild fruit the trees, shrubs, and vines had to offer, without bestowing any care in return. Practically every fruit of the temperate zone and many of the desirable fruits of the tropics grow today in North America but the American Indians had only a few varieties of crab-apples, and berries such as strawberries, mulberries, and huckleberries. Our modern fruit industry chiefly depends on the fruits which the white settlers brought from their homelands across the water—fruits that had been cultivated for hundreds and even thousands of years in Europe and Asia.

Fruits with tempting flavors highly developed, seedless, thin-skinned, and oversized fruit, and fruit stalks without spines or thorns—these are some of the marvelous changes due to man's experiments in fruit growing (see Burbank, Luther). Such results have been obtained in some cases by cross-fertilization between two species so that the desirable qualities of both are combined in one hybrid.

However, the seeds of hybrids and other choice varieties obtained by careful selection and cultivation will not usually run "true to type." Trees and shrubs grown from such seeds tend to go back to the form and

habits of their wild ancestors. To overcome this difficulty, the process of grafting is used, by which a bud or twig of the choice variety of tree or shrub is made to grow from the roots or stem of a common or even a wild member of the same tribe. The bud or twig, called the "scion," is inserted in a cleft cut in the "stock plant," and the joint is then dressed and bandaged to protect it from the air. If this "plant surgery" is properly performed, the two will knit together and grow like broken bones when they are set by a physician. And the resulting "new" tree will bear the same fruit as its parent stock.

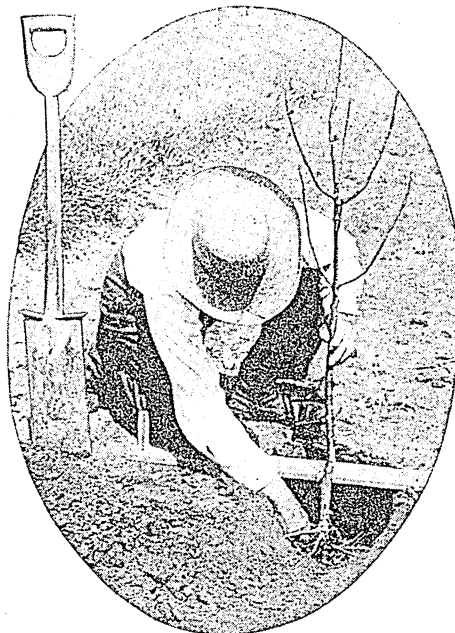
Great numbers of fruit seedlings are raised to provide the stocks on which choice cuttings are grafted in special nurseries. The combined stock and scion are then transplanted to the orchards.

Great changes in the fruit industry have come about by refrigeration and rapid transportation (see Refrigeration). Previously apples were practically the only fresh fruit enjoyed in winter. Perishable fruit could be eaten fresh only in season and in the locality where grown. Now the fruits of the South are regularly shipped to the North when fruits there are not in season, and fruits of many kinds are kept in cold storage warehouses for winter use. Many American fruits are shipped to England and other countries, and in return various native fruits are brought from practically every country of the globe—melons from

Argentina, olives from Spain and Greece, dates from Iraq, and bananas from Central America, Mexico, Cuba, and Colombia. Fresh apples, lemons, bananas, and oranges are supplied throughout the year, while pears, strawberries, grapes, and peaches which a half-century ago were enjoyed only for a few weeks are now on the market many months. Bananas were once expensive novelties found only in large seaports. So, too, the *avocado*, also called the *alligator pear*, has become a standard salad fruit. This native of sub-tropical America has a rich, oily pulp with a protein content more than twice that of the commoner fruits. First-grade fruit from California is marketed under the trade name *calavo*. Florida and Cuba also grow *avocados* commercially. The *mango* (see Mango) and the tropical *papaya*, or *papaw*, a fruit resembling a small cantelope, are now raised in Florida and California and are slowly gaining favor in northern markets. Many other tropical fruits are

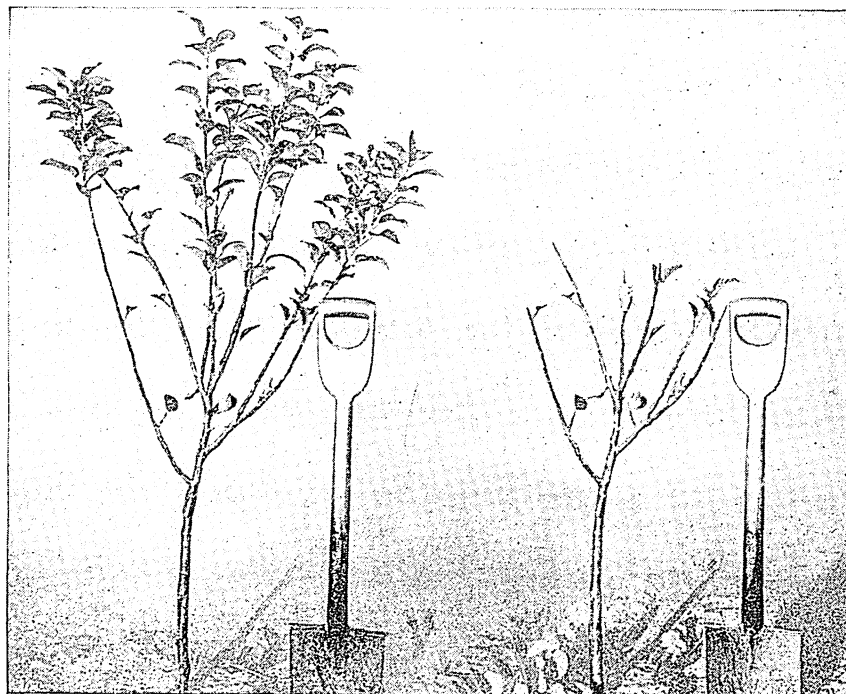
as yet little known outside the areas where they grow, except in the form of preserves. Such fruits are the *sapodilla*, the apple-shaped fruit of a large evergreen tree which also supplies the chicle used in chewing gum; the *tamarind*, which has long brown-shelled pods containing a brown acid pulp used in making cooling drinks and marketed in sweet preserves; the *loquat*, a Chinese or Japanese fruit now cultivated in the Gulf States and resembling a yellow plum; the *cashew apple*, the fine-flavored fleshy stalk on which is borne the nut of the tree; *guava*, represented by the two varieties, red and white, one shaped like an apple and the other like a pear, the pleasantly acid pulp of which is made into guava jelly; *mango-steen*, a reddish brown fruit about the size of an apple and having white juicy pulp of delicate sweet and acid flavor; *cherimoyer* or custard apple, the small heart-shaped pulpy fruit of a little tree grown in Colombia or Peru; and the *star apple*, a

PLANTING A FRUIT TREE



Young trees should be transplanted an inch lower than they were planted in the nursery. A board is used to gauge the depth of the planting.

A YOUNG TREE BEFORE AND AFTER PRUNING

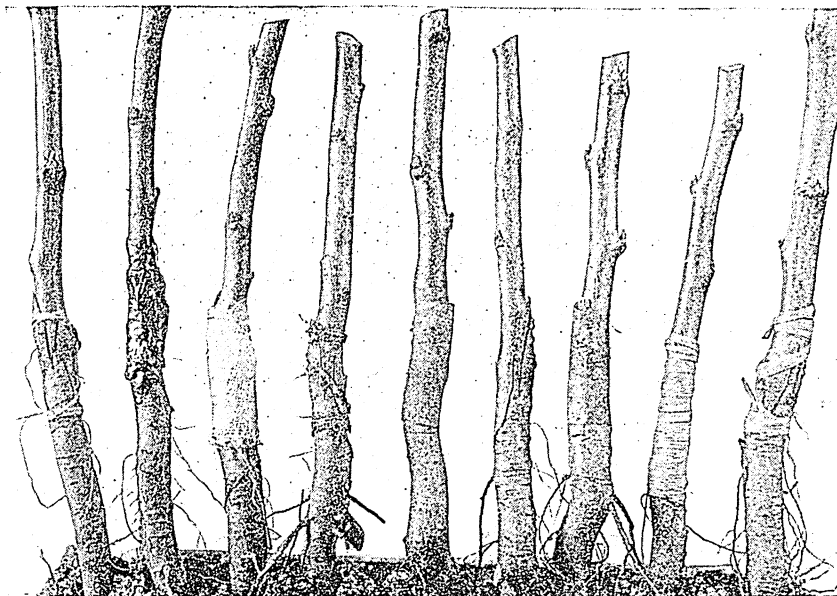


When trees are brought from the nursery, the tops should be cut back so that there will be a balance between the amount of top and the amount of roots remaining. Unless this is done transplanted trees usually do not get on well.

West Indian fruit like an apple in size and appearance with a star-shaped center formed by the seed cells.

While we still have the small fruit garden, and the farm orchard of 50 or more trees, this wider distribution of fruits has developed commercial orchards spreading out over thousands of acres of irrigated land. Thousands of workers are employed on the large projects in picking, sorting or grading, packing, and marketing the fruit. The workers must know their trade and work with nimble fingers. The fruit, picked just at the right time, which is before it is ripe, is carefully handled, wrapped, and closely packed to prevent bruising which might cause the fruit to rot before reaching the market. In most of the fruit areas the grading, shipping, and marketing, even

THE BEST WAY OF WRAPPING ROOT GRAFTS



These pictures illustrate experiments made by the Department of Agriculture at Washington to determine the best method of wrapping root grafts. The materials used were cloth, rubber, waxed paper, plain thread, and waxed thread. One you see was left unwrapped and in another the union was waxed without wrapping. The conclusion from the experiments was that cloth is the best wrapping to use.

the advertising, is carried on by effective coöperative organizations. They strictly supervise the quality so that the reputation may be maintained and so enable them to market the product at the best rates for the producer.

Chief Fruit Grower of the World

The United States leads the world in quantity and variety of orchard fruits. The largest, most valuable, and most widely distributed fruit crop is apples, grown chiefly in Washington, New York, Virginia, Pennsylvania, California, and Michigan. Oranges rank next, though most of the crop comes from but two states, California and Florida. Peaches are usually in third place, about half the commercial crop coming from California and Georgia. Grapes rank fourth, without counting their products such as raisins and wine. California is by far the leading grape grower, followed by New York, Michigan, Ohio, and Pennsylvania. Strawberries, most important of the berry crops, are grown in Louisiana, California, Arkansas, Oregon, Tennessee, Michigan, Florida, and many other states. Melons, lemons, pears, prunes and other plums, grapefruit, cherries, apricots, and cranberries are other large commercial fruit crops.

Many native fruits, including crab apples, plums, and cherries still grow wild. Berries too, such as raspberries, strawberries, blackberries, and goose-

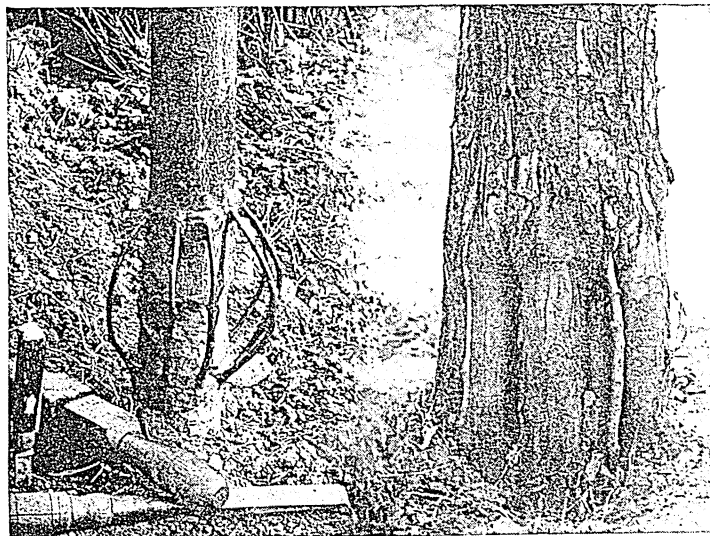
berries, are found both cultivated and growing wild. Blueberries grow wild in a limited area and their cultivation has only been undertaken as an experiment on a small scale. Cranberries, which grow wild in cool climates, are extensively cultivated in some of the northern states. Elderberries and the scarlet haws or thorn-apples are little known, although the wild fruit is used for making jellies. The wild grape, papaw, and may-apple or mandrake are also found in the wildwood.

Starting and Caring for an Orchard

The fruit grower chooses well-drained land for the orchard site, with good subsoil to a depth reached by the tree roots. The young trees grown in a nursery

are set out in regular spaced rows in the orchard when they are one or two years old. The orchard is cultivated to keep out the weeds and sometimes cover

SAVING A TREE'S LIFE

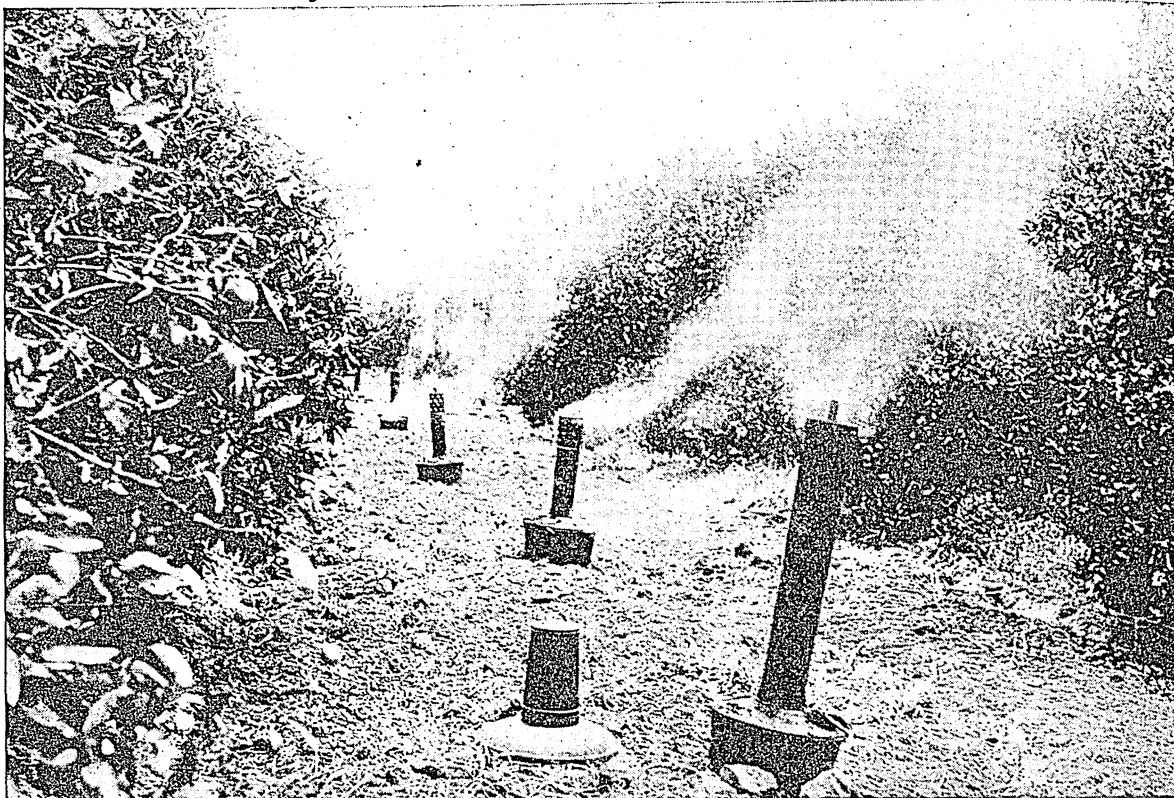


Rabbits and other small gnawing creatures sometimes chew off a circle of bark around the base of a tree. When a tree has been "girdled" in this way, the sap cannot rise and the tree will die unless something is done quickly to save it. Here is one of the rescue methods, called "bridge grafting." The tree on the left is newly grafted. In a few years it will look like the tree on the right, for not only do the grafts carry the life-giving sap, but they grow along with the rest of the tree.

crops such as clover or alfalfa are grown and then turned under to add nourishment to the soil.

Another important operation in orchard and vine-

SMOKING JACK FROST OUT OF THE ORANGE GROVES



Even in the warm climates where oranges grow, the nights sometimes are cold and Jack Frost is liable to do a good deal of damage if precautions are not taken. Accordingly, little stove-like affairs, such as these, containing oil, coal, coke, or wood, are set through the orchard, and while the heat warms the atmosphere the smoke helps to form a protecting blanket.

yard is that of spraying to prevent injury to the tree or its fruit from insect or fungus pests (*see* Spraying). Pruning is also very necessary to good fruit. By a proper cutting back of wood growth, fruit-bearing wood may be given increased vigor and the tree opened up so the sunshine will reach the fruit. Pruning away dead branches prevents injury to the tree through spread of the decay, removes a natural harbor for insects and other enemies of the trees, and removes weight that would uselessly encumber the tree. Even old neglected orchards may be restored to bearing by proper pruning and care.

Fighting Off the Frost

Frost coming after the trees have begun to bud can do an enormous damage to the orchard (*see* Orange). When warning of an untimely frost is sent out by the weather bureau among the fruit-growers of any region, they act promptly to save their precious trees. Smudge fires are started all through the orchard forming a blanket of smoke overhead to prevent the loss of heat through evaporation during the night. For the same purpose a curtain of vapor may be formed over the orchard by spraying water high into the air, and still another method is to fill with hot water a system of pipes running all up and down the rows of trees to keep the temperature above the freezing point.

Fresh fruits, like green vegetables; contain large quantities of water, and are not substantial foods. But they are important in a well-balanced diet for the vitamins and minerals they contain, and because their acids help digestion. Dried, preserved, and canned fruits hold a very important place in our diet (*see* Canning Industry; Dehydrated Food).

Fruits in the botanical sense are the parts of the plant which contain the seeds. To the botanist, the seed-carrying portions of all plants are fruit, even if we do not commonly think of them as such, so that we may name three main fruit classifications: (1) fleshy fruits, such as berries, oranges, melons, gourds, and apples, with seeds in the flesh; (2) stone or drupaceous fruits containing pits or stones, such as plums, peaches, and cherries; (3) dry fruits, including nuts, grains, legumes such as beans and peas, and capsules, pods, or similar containers such as the seed vessels of flowers. In the fleshy fruits, the whole seed envelop or *pericarp* is fleshy or juicy. In the drupes, the part of the fruit around the seed (the *endocarp*) becomes hard or stony, forming the peach or plum or cherry "pit," while the outer portion (the *exocarp*) is fleshy. Dry fruits may be divided into "splitting" fruits, like peas, beans, and poppy capsules, which break open and scatter the seeds, and "non-splitting" fruits, like acorns, grains, and nuts.

FUCHSIA. "What a beautiful plant!" exclaimed a London nurseryman as he entered a sailor's dwelling in the dock district. "Where did you get it?"

The sailor's wife smiled as she looked at the flower that had come from far-off Chile. "My husband brought it from foreign parts," she answered proudly.

The nurseryman recognizing it as one of the same rare plants that had been brought from South America that very year (1788) and placed in Kew Gardens, promptly bought it and procured from its cuttings several hundred plants which he sold for a high price. From these specimens and from others brought chiefly from Central America, Peru, and Chile have come the many plants whose brilliant drooping funnel-shaped blossoms of purple and rose and white make so gay a showing in our old-fashioned gardens and in our homes.

Careful cultivation, selection, and cross-pollination produce an almost unlimited number of interesting varieties. The nectar of the flowers contains an unusually large percentage of cane sugar, and the little four-celled berries are sometimes sweet and good to eat. From certain species a dye is obtained.

The fuchsias are a genus of plants of the evening primrose family (the *Onagraceae*) containing about 70 known species, mostly natives of tropical America. The common fuchsia or "ladies' eardrop" (*Fuchsia macrostemma*) has 4 light petals borne in the throat of a colored funnel-shaped calyx, 8 stamens projecting outside the corolla, and a 4-celled berry.

FUELS. Just as our bodies depend on food for life and strength, so does the civilization of the world today depend on fuel. It gives us all our steam power and most of our electric power. It drives our automobiles and airplanes. Virtually every ounce of metal we use is extracted from the earth's minerals with the aid of fuels. Look around you and try to find a manufactured article that is not in one way or another a product of fire. There are a few—a hand-carved piece of wood or ivory, for example—but they are not important. Cloth, leather, glass, paper, rubber, celluloid, cement, brick, paint, ink, glue, are all heat-treated in the course of their production.

The similarity of the common fuels to food is much closer than we might realize at first thought. Both contain carbon compounds (*see Carbon*). When we "burn" the carbon from our food inside our bodies with the aid of the oxygen we take into our lungs from the air, we get the heat energy that supplies power to our muscles and nerves. In the same way, all the ordinary fuels we burn in our stoves, power

plants, engines, and chemical processes, release their stored-up energy by oxidation of their carbon ingredients. (*See Energy; Fire; Power; Respiration.*)

Primitive man burned wood to heat his cave, to cook his food, and to frighten off wild animals. At his simple hearth he learned to fashion crude tools and weapons. And he found he could use animal and vegetable oils and fats for light and sometimes for heat. The first step towards the development of a better fuel probably was the discovery, made in prehistoric times, that charcoal gave more intense heat than wood (*see Charcoal*). A statement made by the philosopher Theophrastus

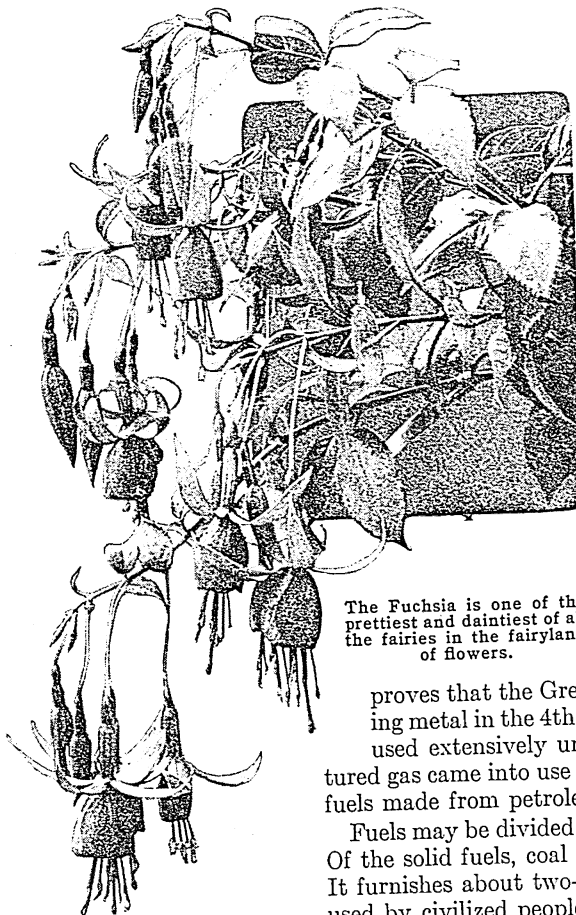
The Fuchsia is one of the prettiest and daintiest of all the fairies in the fairyland of flowers.

proves that the Greeks were using coal for smelting metal in the 4th century B.C., but coal was not used extensively until modern times. Manufactured gas came into use early in the 19th century, and fuels made from petroleum a half-century later.

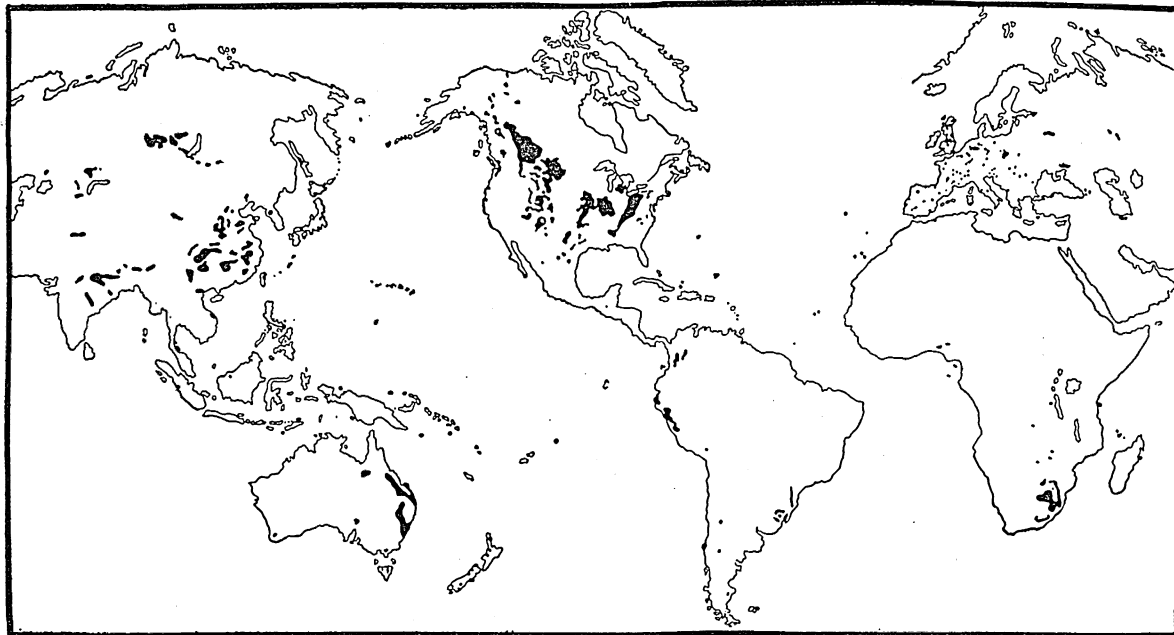
Fuels may be divided into solids, liquids, and gases. Of the solid fuels, coal is by far the most important. It furnishes about two-thirds of the power and heat used by civilized peoples, and more than half of the heat energy used, even if fuels employed by primitive peoples are taken into account (*see Coal*).

Coke, which is left after the extraction of coal gas and coal-tar products from coal, is much used in homes and factories because it gives intense heat without smoke (*see Coke*). Peat burns slowly, is smoky, and has a low heat value, but it is cheap and is invaluable to the inhabitants of regions where no other fuel is available (*see Peat*). Wood has greatly declined in importance as a fuel. In heat value it is inferior to coal, and it is far more expensive in the centers of population. Coke has replaced charcoal for smelting ore. Other solid fuels are paraffin, wax, and tallow, usually burned in candles.

The principal liquid fuels are products of petroleum—gasoline, kerosene, and partly refined crude oil or residue called fuel oil (*see Petroleum*). Fuel oils are



WHERE THE WORLD'S STORES OF COAL ARE FOUND



The black spots on the continents indicate the location and the approximate size of the world's important deposits of coal. The huge deposits in North America at once strike the eye; but most of the western deposits are not equal in quality to those in the east. Europe, central Asia, India, China, South Africa, and Australia also have extensive deposits; but the most densely settled portions of South America are noticeably poor in coal. The deposits also are poor in quality. The map shows the continents practically correct as to area, but badly distorted in shape and location.

widely used for heating homes and other buildings (see Heating and Ventilation); but most of it is used in locomotives and steamships. Fuel oils are easy to store and handle; they can be piped into the firebox without labor; and they have twice the fuel value of coal, in proportion to space occupied. Animal and vegetable oils once were the only fuels used in lamps for lighting; today kerosene has replaced them in all but primitive communities.

The most important gas fuels are natural gas from petroleum wells and manufactured coal gas and water gas (see Gas, Manufactured; Gas, Natural). Each kind is widely used for cooking and heating in city homes and for heating in many industrial processes. These fuels have high convenience value, since they can be turned on or off instantly and give no ash or smoke. Acetylene is another fuel gas which has important uses. It is used in oxyacetylene torches and in the lighting system of buoys (see Acetylene).

Fuels for Internal Combustion Engines

During the century when the steam engine reigned supreme, fuels were used indirectly to generate power. They were burned in a boiler to make steam, and the steam made the power. The internal combustion engine eliminated the boiler by burning fuel in the engine itself, and using pressure from the hot gas to provide power (see Gas Engine). This type of engine has been particularly valuable for transportation.

These engines have created many fuel problems, however, because they need a fuel which generates power almost explosively. The Diesel engine accomplishes this with cheap fuel oil by using intense com-

pression. Gasoline has proved the favorite fuel, however, in all countries which can obtain a cheap supply.

Wherever gasoline is expensive, constant efforts are being made to use cheaper fuels. Charcoal has been tried with considerable success in Europe, in China, and elsewhere. A jet of steam passing through a glowing hot mass of charcoal generates gas which burns like gasoline in the motor. The principal objection to charcoal is the bulkiness of the fuel and of the gas-generating apparatus.

Grain alcohol has many desirable properties as a fuel for internal combustion engines and for heating. It gives intense heat or power in proportion to bulk, and creates no ash or smoke. But it is not as powerful as gasoline, and countries which use it to lower the cost of motor fuel do so by mixing alcohol with gasoline. Such mixtures have been tried in the United States, but they have no advantages over low-cost American gasoline. The use of these mixtures is urged rather as a means of conserving petroleum, and of giving farmers a new market for grain and other produce suitable for making alcohol.

Fuels and National Power

The development of nations has been greatly affected by the possession or lack of fuel. Great Britain, for example, owed the rise of her industrial power largely to her abundant coal deposits. Much of the prosperity of the United States is traceable likewise to natural wealth of coal and oil. South American countries, on the other hand, have been handicapped by difficulties in obtaining adequate fuel supplies. An interesting incident in the history of fuel was the rise

of the rich whaling industry of New England in the 18th and early 19th centuries—an industry dependent largely on the use of spermaceti and whale oil for making candles and for burning lamps. With the advent of kerosene, the industry virtually disappeared.

What is the future of fuels? The question is often raised about what the world will do when its natural supplies are exhausted. But it is doubtful if even our remote descendants will have any cause to worry. Alcohol, if necessity arises, can always be manufactured in virtually unlimited quantities, and scientists know already how to produce many synthetic fuels which would be available now if the supply of cheaper natural fuels were cut off.

The thermal or heating value of fuels is measured in calories or in British thermal units (*see Heat*).

FULLER'S EARTH. The "fullers" of woolen cloth prepared it by "fulling" or shrinking, using a peculiar clay to absorb grease. The clay was named "fuller's earth." In the home it is used to remove stains and grease from clothing. Its greatest commercial use is to purify and decolorize mineral oils, and some vegetable and animal oils. It is used also in soaps, cleansing preparations, and wall paper pigments. It consists of very fine colloidal particles, largely silica, with some calcium, aluminum, and iron oxides. In America it is found chiefly in Georgia, Florida, and Texas.

FULTON, ROBERT (1765-1815). Up the Hudson, against wind and tide, one bright August day in 1807 chugged Robert Fulton's steamboat, the *Clermont*.

Crowds gathered on the New York wharves to jeer at what they had been calling "Fulton's Folly" were surprised into noisy cheering as the boat moved steadily along. Rivermen stood on the decks of their sailing vessels watching this terrifying craft steam past them. It was like a fearful monster with its engine creaking and snorting, its side paddles splashing and its dry pine fuel sending clouds of ink-black smoke with showers of sparks and tongues of flame out of the tall stack. All the way to Albany and back to New York the steamer puffed along without serious mishap, making the journey up in 32 hours and the return trip in 30, with the wind against it both ways. The experiment was a triumph, and won instant acclaim for Fulton.

However, the *Clermont* was not the first steamboat; nor was any part of it entirely original with Fulton,

but it was the first boat so assembled and designed as to make steam navigation wholly successful. Only two weeks after its maiden trip, the boat was put into regular scheduled service between New York and Albany.

Fulton was born Nov. 14, 1765, of Irish parentage on a little Pennsylvania farm in what is now Fulton Township. His father died when Robert was still a boy, leaving the family poor. At 17 Fulton went to Philadelphia to work for a jeweler and to study art. So well did he use his time and talents that at 21 he had \$400 to invest in a farm for his mother and sisters before going to London to study art with Benjamin West.

But a lively minded youth who earned \$400 and bought a farm while studying painting evidently had practical qualities. English friends encouraged him to turn engineer, and art was soon forgotten in the midst of a series of useful inventions of dredging machines, flax-spinning and rope-making devices, and a substitute for canal locks.

Fulton Finds the Way to Success

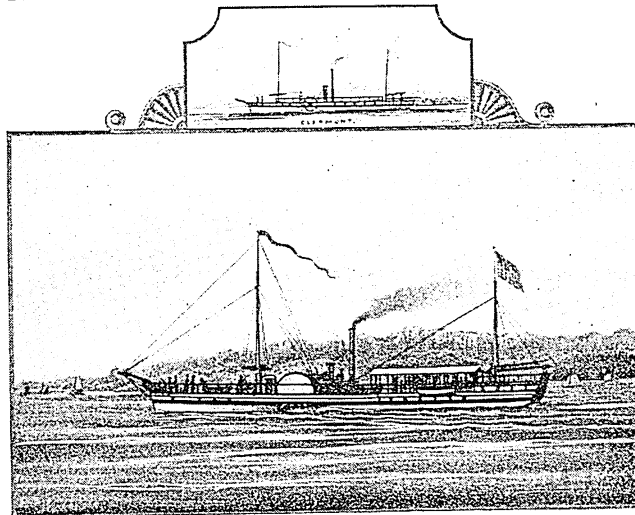
In the harbor of Brest he demonstrated a torpedo-firing submarine, but failed to interest Napoleon's engineers. He did interest the American minister, Robert Livingston, however, in his steamboat experiments on the Seine. As a partner of Livingston he returned to America to work out a practical steamboat, using an engine and boiler he had purchased in England, from James Watt, and his partner, Boulton. Some of those who pioneered in steam navigation

before Fulton were the Frenchmen, Denis Papin and the Marquis de Jouffroy; the Englishman, Jonathan Hulls; the Americans, James Rumsey and John Fitch; and Scotsmen William Symington and, somewhat later, Henry Bell. These men may have had the vision to foresee the practicability of steam navigation and to design the working principles for such vessels, but Fulton's own contribution was to make the steamboat a commercial success.

Fulton triumphed where others failed because he was tenacious,

shrewd and had great personal charm that won him friends and the necessary financial backing. In 1815 he built for the United States the first steam warship. He was never wealthy, and overwork and lawsuits about patents undermined his health. He died in New York City Feb. 24, 1815.

THE 'CLERMONT' DRAWN BY AN EYE-WITNESS



At the top is the *Clermont* in 1807, its 24 horse-power engine mounted in a hull 100 feet long. The next year the boat was enlarged and altered as shown in the lower picture. The original painting is owned by the New York Historical Society.

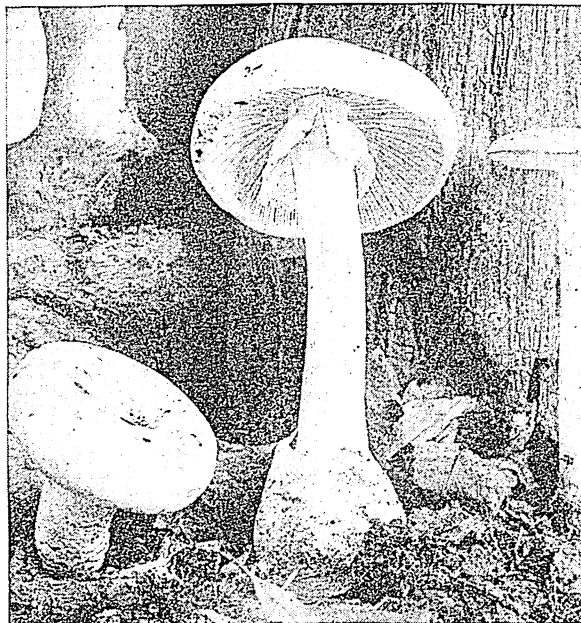
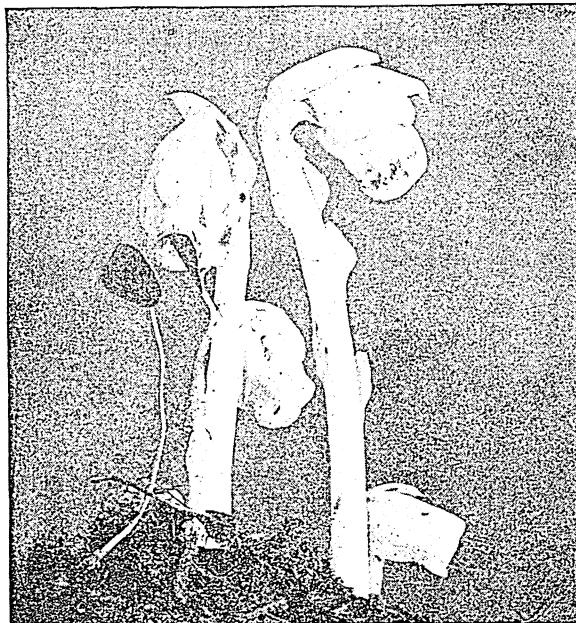
FUNGI (*fūn'jī*). A large group of very simple plants, distinguished by the fact that they do not contain the green coloring matter (chlorophyll) possessed by higher plants, are known as *fungi*. This group includes all molds, mildews, rusts, smuts, yeasts, truffles, puffballs, toadstools, and mushrooms. Since they lack chlorophyll with which to manufacture their food out of raw materials, the fungi are compelled to live upon the food produced by other plants and animals. When they get their food from living creatures, fungi are called "parasites"; when they live on dead animal or vegetable matter, they are called "saprophytes." Parasitic fungi and their cousins, the

because they feared to call such terrible beings by their true name.

Their number varied, but usually they were spoken of as three: Megaera (the grimly jealous), Alecto (the unwearied persecutor), and Tisiphone (the avenger of murder). Nothing, it is said, escaped their sharp eyes, as they pursued the evil-doer with speed and fury, permitting him no rest. A famous drama of the Greek poet Aeschylus deals with their pursuit of Orestes, son of Agamemnon, for the slaughter of his guilty mother Clytemnestra.

FURNACE. The type of furnace with which you are probably most familiar is that which heats the air or

THE "GHOST FLOWER" AND THE "DEATH CUP"



The plant on the right is the deadly Amanita or "Death Cup," one of the most poisonous members of fungus society. On the left is that strange plant called Indian Pipe or "Ghost Flower," which is often found growing in moist dark northern forests. While it is not classed as a true fungus, it looks and behaves very much like one, for it has no green coloring matter and gets its nourishment from the roots of other plants and from decaying vegetable mold.

bacteria (called fission-fungi), do much harm, causing diseases in men, animals, and plants. The saprophytes, however, are valuable scavengers.

Fungi range in size from the tiniest molds to the huge toadstools. Many varieties such as the lichens are eaten by wild animals. Some, like mushrooms and truffles, are highly prized delicacies for human food. Certain others are used for making drugs and dyes. Yeasts are among the most useful of all fungi.

Fungi are divided into three groups: *Phycomycetes*, such as black mold, downy mildews; *Ascomycetes*, such as mildews, truffles, cup-fungi, yeasts; *Basidiomycetes*, or rusts, smuts, mushrooms, toadstools, and puffballs.

FURIES. These avenging deities of Greek and Roman mythology were daughters of Night, or according to another myth they sprang from the blood of the mutilated Uranus when he was slain by his son Saturn or Cronos. The Greeks called them *Erinyes*, the "angry ones." They also called them *Eumenides*, the "well-minded" goddesses, probably

water or generates the steam by which houses and public buildings are warmed (see Heating and Ventilation). But there are also various types of furnace used in manufactures. These may be classified as furnaces in which the fire and the material to be heated are brought into contact—as in the blacksmith's forge, the blast furnace, and the cupola; furnaces in which the fuel is in one compartment and the substance to be heated in another—as in the reverberatory furnace used in making iron and steel; and furnaces in which the material to be heated is in a closed chamber or sealed retort heated by external flames, hot gases, or electricity—as in pot furnaces for making glass and crucible furnaces for making steel (see Glass; Iron and Steel).

Perhaps the most interesting type is the modern electric furnace, out of whose furious blasting heat have come some of the most amazing achievements of modern chemistry. With the aid of its tremendous

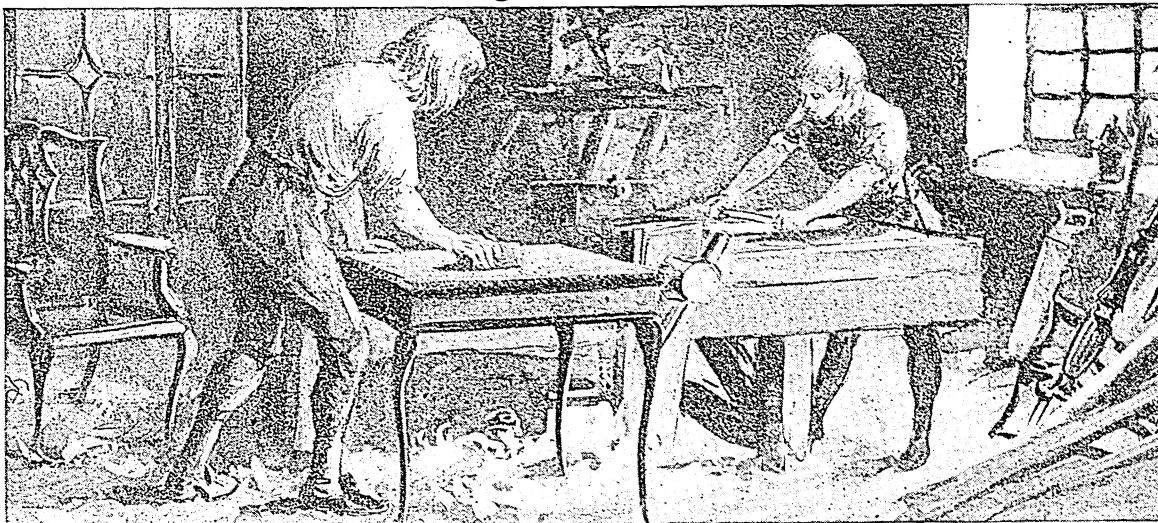
temperatures—7,000° Fahrenheit and more, double that of the hottest furnace fed with ordinary fuel—we can melt platinum, chromium, tungsten, molybdenum, and other refractory metals from their ores. We can fuse quartz and blow or mold it like glass to make retorts and other laboratory apparatus which may be heated and plunged into ice water without breaking. We can take carbon in one form, ordinary coal, and turn it into another form, graphite. Carbon and silicon are fused into one of the hardest substances known, carborundum, so much used for grinding and polishing metal. Carbon and lime are forced to unite to make calcium carbide, which we use to make acetylene gas. Phosphorus is stewed out of phosphate rocks, to be used in making matches. Most of the alloy steels, used in modern manufacturing, are made in the electric furnace; and the electric furnace

is being used more and more instead of the Bessemer and other processes in the production of iron and steel.

Most wonderful, perhaps, of all the miracles of the electric furnace is the fixation of atmospheric nitrogen. Enormous furnaces in which electric arcs are drawn out into great disks or spirals of flame are used to force the nitrogen and oxygen of the air to combine, forming nitric oxide, which is easily turned into nitric acid or nitrates for fertilizers and explosives.

There are several types of electric furnace, but they all consist essentially of a crucible of some non-conducting heat-resisting material. In the arc type, a powerful current is passed between electrodes or from electrodes to the substance being treated, causing tremendously hot electric arcs. In another type, the crucible is surrounded by wires or rods which are heated by the passage of current. Chrome nickel can be used for the current up to temperatures of 1,000° C. For higher temperatures, molybdenum or platinum is required, usually in an atmosphere of hydrogen, to avoid oxidation.

FURNITURE *Making*—ANCIENT *and* MODERN



One of the greatest of furniture makers—Thomas Chippendale—is shown here working with an apprentice on one of the beautiful tables which made his name famous. This careful hand labor of the master craftsman has today been replaced by the speedier but less artistic work of whirling machines, as illustrated at the end of this article.

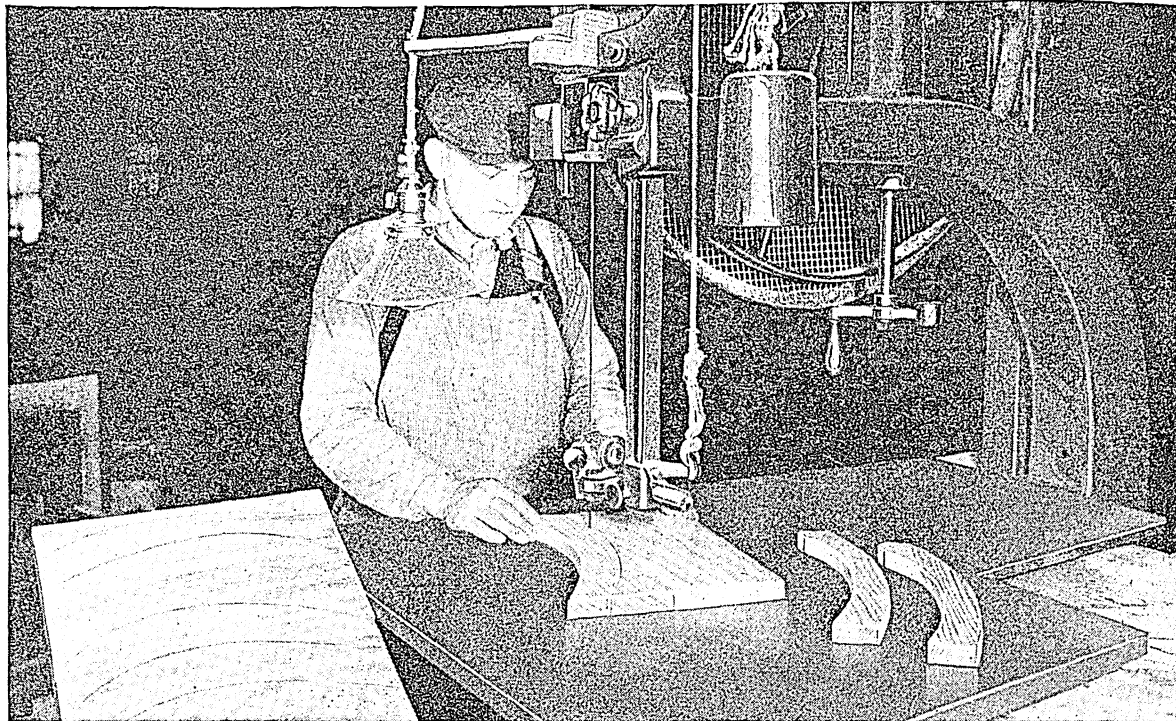
FURNITURE. The making of furniture distinguished for beauty and grace, as well as merely for utility, was once a handicraft which great artists did not feel to be beneath their dignity. Today, the invention of modern machinery has made it a factory process, in which fine individual workmanship is too often lacking. Accomplished artists are employed by manufacturers, it is true, to design furniture, but the substitution of the machine for the workman has robbed even the finest specimens of modern furniture of a great part of the artistic charm and personal touch which delight the collector of specimens made in earlier times. On the other hand, furniture making is one of the most widely dispersed industries in the United States, with a combined annual output valued in some years at over \$850,000,000.

In ancient times and throughout the Middle Ages, houses were very scantily furnished. Chairs were

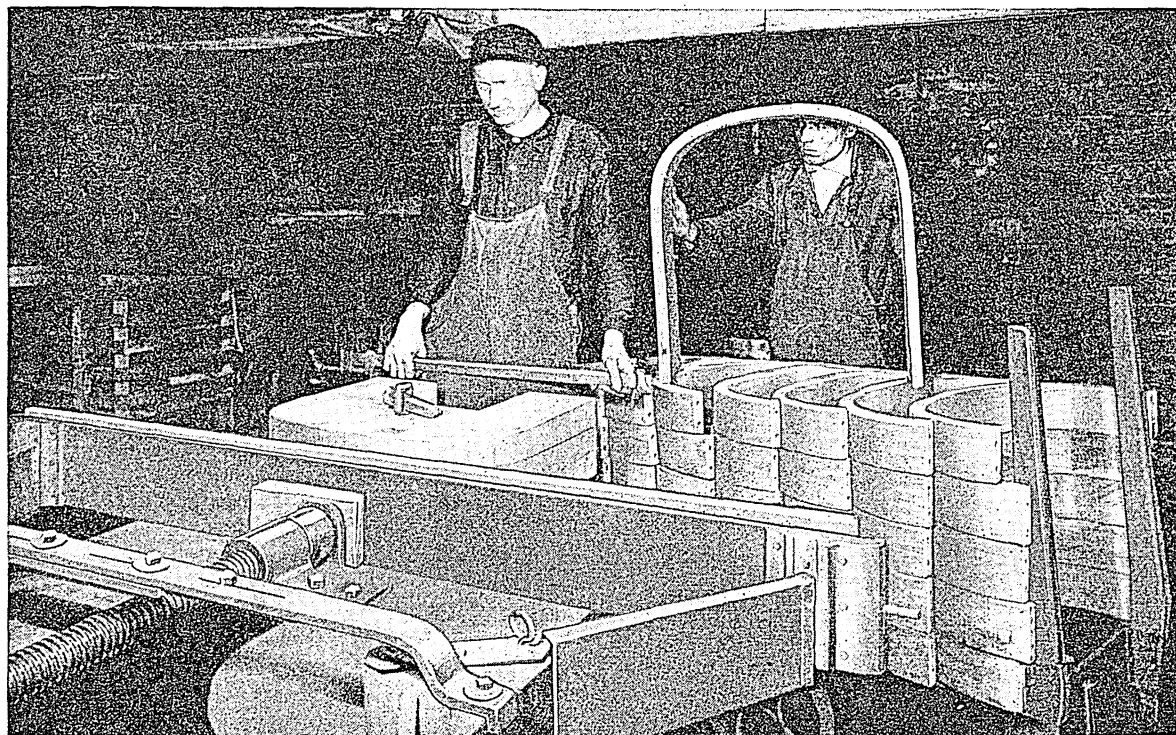
reserved for the lord of the house and favored guests; stools and benches, chests for clothing, beds, and tables—which were often just boards laid across trestles—formed the greater part of the furniture. Egypt, Greece, Rome, and other ancient nations had elaborate pieces of furniture made of ivory, bronze, silver, and gold, and decorated with precious stones, but these were rare and belonged only to the great. The poorer classes had no furniture save of the meanest sort. The early Egyptians were adept in wood-working, and pictures on their tombs and some pieces that have been preserved indicate that they had wooden furniture, sometimes carved and gilded and covered with splendid textiles.

In western Europe specimens of furniture made before 1500 are exceedingly rare. The carved Gothic paneling of the bedsteads, screens, chairs, and other pieces dazzled the eye with their blue, gold, and

MAKING THE CURVED PARTS OF FURNITURE

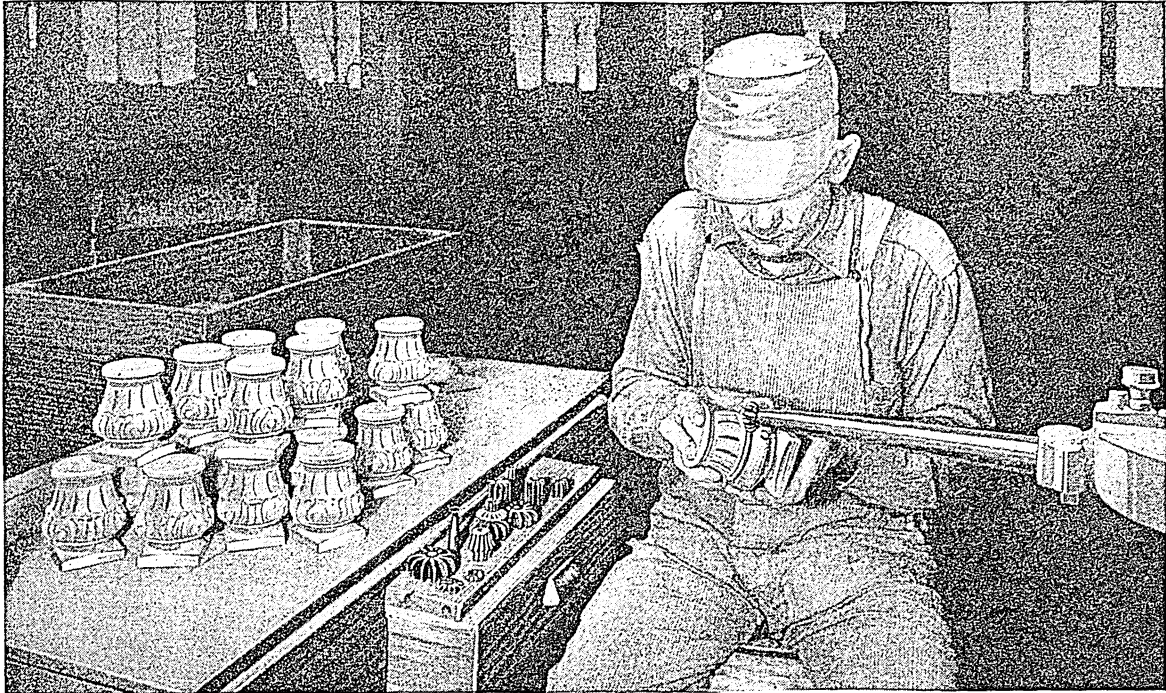


The illustration shows one of the methods of making curved parts for furniture. The pattern which has been marked on the wood is cut out with a band saw, operating at great speed through a hole in the steel table.

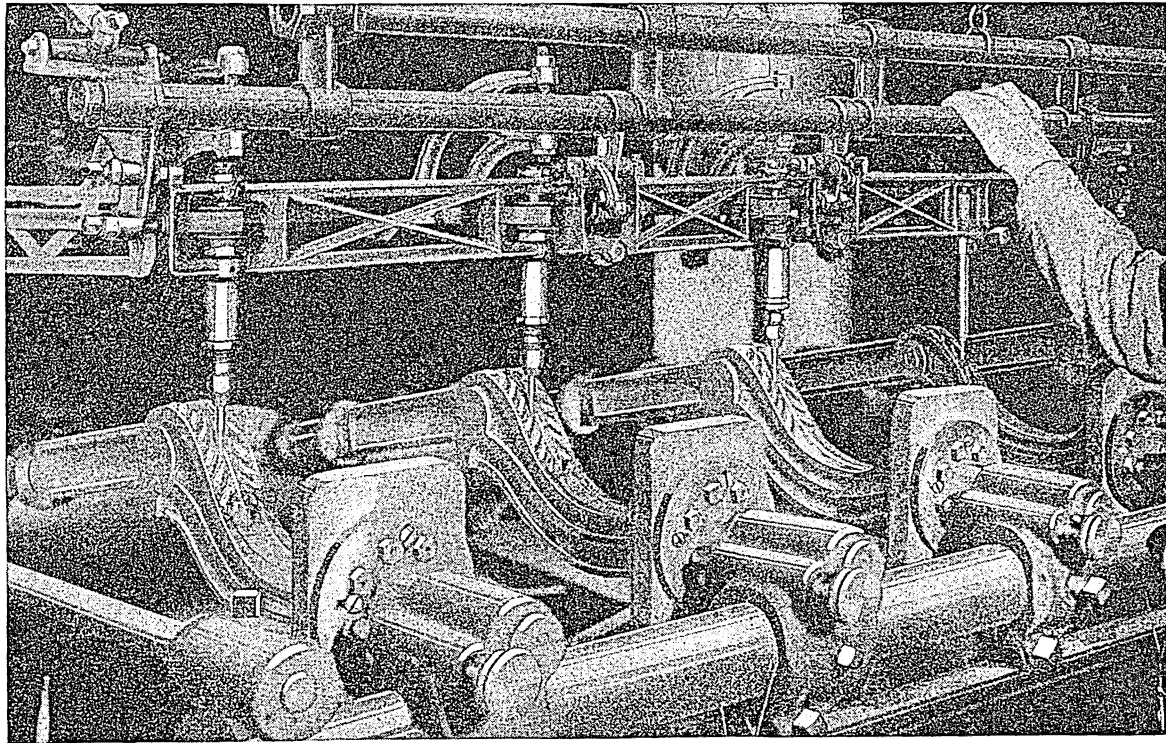


Here the curving is accomplished by the use of steam and pressure. The plank is first placed in a compartment filled with steam to give it pliability so that it will not break when put into the press. After being steamed, the plank is fastened in the pliable metal holder which you see here. The machinery then pushes both ends forward around that curved form, until the wood is bent to that shape. Then the man fastens both ends with the clamp he holds in his hands, and after it has remained for a time in this position, it holds its curved shape.

HOW WOOD CARVING IS DONE BY MACHINERY



The man in the upper picture is a "spindle carver" and is making some ornamental pieces for legs and other parts of furniture. He takes a perfectly smooth piece of wood of the form required and by the use of those little rotary knives of various shapes, cuts it in intricate designs. The appropriate knife is attached, as you see, to the revolving arm and the workman has only to hold the wood at the proper angle.



This picture shows a machine that carves six legs exactly alike at the same time. You can see three of the legs here. What appears to be a fourth leg, at the right, is a steel pattern. The machine works on the principle of the pantograph. On the right, directly under the man's hand, is the guiding needle which goes over the pattern. The revolving knives repeat this pattern exactly on the wooden legs. Every furniture factory has many machines of this type.

scarlet. The Renaissance, with its revival of ancient classical literature and art, introduced styles based on classic models. Florence, Milan, Rome, and Venice became important centers of cabinetmaking, and from Italy the craft rapidly reached out to the rest of Europe. The Renaissance styles continued to dominate for nearly two centuries.

In France, especially in the age of Louis XIV, in the last half of the 17th century, furniture of exquisite design was produced. Among the most famous of the French craftsmen was André Charles Boulle, whose wonderful inlaid furniture of tortoise-shell, ebony, and copper was said to resemble fine jewelry inlaid in wood. Many pieces of Boulle furniture, valued at fabulous prices, are treasured at Versailles. Imitations have been sold under the name of "Buhl" furniture.

In England, the latter part of the 18th century—the mid-Georgian period—was the great epoch of achievement in furniture making. Mahogany and satinwood took the place of oak, and grace and beauty of design, accompanied by skilled craftsmanship, marked the work of Thomas Chippendale, George Hepplewhite, Thomas Sheraton, and the Adam brothers. The styles established by this brilliant mid-Georgian school, and by the French artists, have prevailed to the present day, in both Europe and America.

In the American colonies, during the mid-Georgian period, simple and substantial furniture began to be designed. Among the American craftsmen of this period whose work stands out was Duncan Phyfe, from whose shop on Partition Street (now Fulton Street) in New York City, came beautiful lyre tables and sofas, a type distinctly American. His furniture became prominent about 1800, when the Astors started the Duncan Phyfe vogue. Existing examples of Phyfe's work are almost priceless. (See American Colonies; Interior Decoration.)

Use of Machinery in Furniture Making

In 1815 the power lathe was first applied to the making of furniture, and in 1825 the circular saw was invented. Since 1859 most furniture has been made by machines, which cut, polish, and even assemble the articles. Some of the polishing is still done by hand, but there is little individual construction work. Even in shops where all the fine work is done by hand, the pieces are usually rough-shaped in a factory by machinery. In the days of the craftsmen much time was spent on the shaping and hand carving of the legs for a table. Beautiful designs were worked out, and the entire table was finally hand polished by rubbing until the surface was almost mirror-like. Today many table legs of identical appearance are turned out in the same operation by multiple machines, and even the final polishing is usually done mechanically. Another machine carves several chair tops at one time; a tracing point follows the model, while cutting instruments work out the same design on several pieces of wood. However, of late years there has been a trend toward hand-carved work,

both in Europe and the United States. Oriental furniture is made by hand with great care, especially in China and Japan.

Before the wood used for furniture goes to the factory, it is thoroughly dried in kilns to prevent warping. At the factory it is cut into proper length, width, and thickness by circular cross-cut saws, circular rip-saws, and band-saws. A band-saw is a narrow-bladed saw running through a slot in a bench or table. The narrow blade can cut curved as well as straight pieces. Furniture factories also use machine planes—some of which smooth four sides of a stick at one operation—sand-paperying machines, dove-tailing machines, and jig-saws, a form of band-saw that can be adjusted to cut in any direction.

American Contributions to the Art

Many unusual features in furniture are due to the ingenuity of American manufacturers, including rocking-chairs, combination chiffoniers, and folding beds and couches. The teaching of woodworking in schools is likely further to elevate the standard of taste and workmanship in furniture manufacture (see Woodworking). Chairs and other furniture made of wicker and other forms of basketry have found much favor. These are woven by hand from "osiers" or willow shoots and various tall woody grasses known as "reeds." The so-called "fiber" furniture is woven from paper compressed into strands or twisted over wires.

Various kinds of wood are used for furniture, and the vogue changes as often as do the designs. Black walnut, maple, and mahogany were fashionable early in the 19th century; then cherry, ash, and oak became popular. Many woods are favored today, such as oak, red gum, maple, black walnut, birch, tupelo, mahogany, orientalwood, and satinwood. Much furniture is veneered, that is, surfaced with thin strips of hardwood over a "core" of lighter wood (see Veneer). Yellow poplar and basswood are often used for cores.

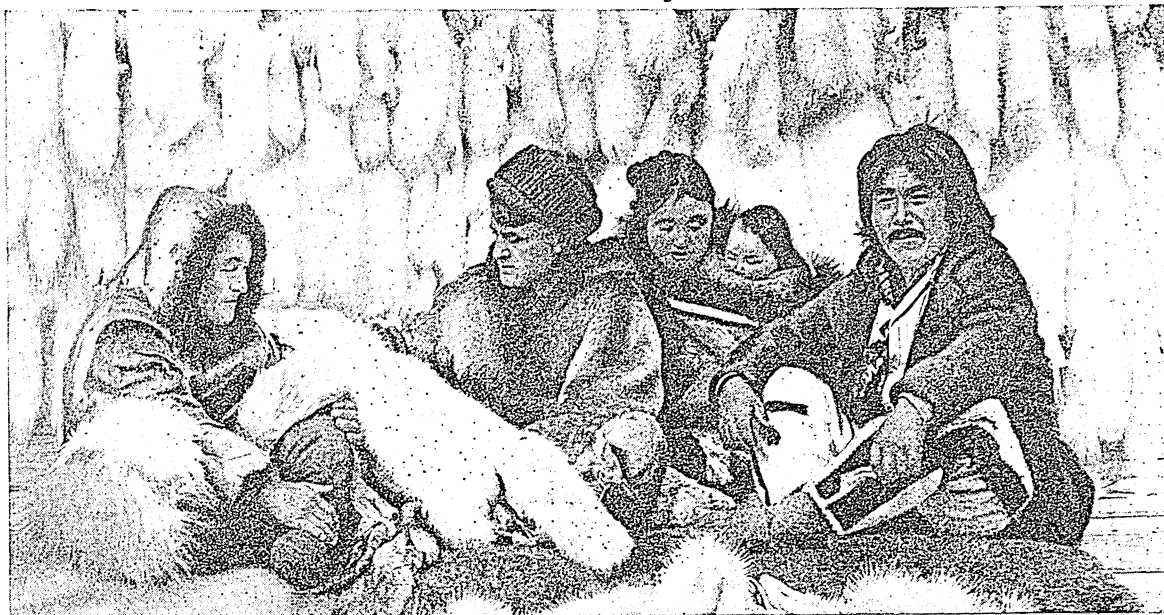
Before polishing, the grain of the wood is treated with a filler, after which shellac, or other varnish is put on, as many coats as necessary. Each coat is rubbed with pumice when dry, which produces the final high polish. French, wax, and spray are different kinds of polishing. Some furniture is painted or lacquered.

Metal furniture, usually made of aluminum alloys, and furniture made of plastic materials reinforced with steel or other metals, are modern developments (see Aluminum; Pyroxylin Products).

Styles change frequently in upholstery materials also. An almost endless variety of fabrics and patterns has superseded the slippery haircloth and other materials so popular a few decades ago.

The great centers of the furniture industry in the United States are New York City, Chicago, Grand Rapids (Mich.), Philadelphia, Cleveland, St. Louis, Boston, San Francisco, and Evansville, Ind. Furniture making is also becoming an important industry in several southern states.

The FUR TRADE—A HISTORY of HEROES and ROGUES



From far in the frozen North come the finest furs today, the silky fox skins, true seal, and white winter ermine. Above, we see, at the left, Nanook himself, of motion-picture fame, showing a fine pelt to a trader for Revillon Frères, who have extensive interest in the far North. Nyla, "the smiling one," wife of Nanook, with her baby tucked inside her own fur garment, sits at the rear, against a background of a fortune in costly fox skins.

FURS AND FUR TRADE. The sudden wave of exploration which sent "the star of empire" traveling westward with such incredible speed in America was due in large part to the very practical dream of getting rich from the fur trade. Furs had been greatly prized in Europe ever since the Crusaders had found the Saracens dressed in beautiful furs and had brought the fashion back home.

Of course, all the early settlers in America, whether they came to seek fortune, religious freedom, escape from the law, or for mere adventure, had soon come to depend on furs for winter garments, and had learned much from the Indians about how to prepare them. But it was not the simple farmers of New England who originated the great fur trade, but the woodsmen of New France.

As New France spread westward from Quebec to the Great Lakes, adventure-loving Frenchmen, quick to learn and adopt Indian ways, pushed out more and more boldly into the wilderness in search of skins. In New France furs were the chief export, and the only product worth taxing. The French king saw his opportunity for revenue, and forbade anyone to trap without a license, though many did so, and bought immunity with their wealth. The trapper must also pay the value of one-fourth his furs as crown tax to the king, who regarded New France as a purse of gold.

Radisson, Bold Adventurer

Some two score years after Henry Hudson was betrayed by the mutineers in icy, unknown Hudson Bay, there lived in the town of Three Rivers in New France a thin dark boy who looked like an Indian.

His name was Pierre-Esprit de Radisson. He went out to hunt, one May night in 1652, when he was 15 or 16 years old. The Indians slipped up, killed his three companions, among them his sister's husband, and took him captive. He was their prisoner for two years, and was once cruelly tortured when he tried to escape. At last, a boy no longer at heart, he fled to the Dutch settlement at Albany, N. Y., and got back home. He had the steely muscles of an Indian, an Indian's courage and endurance. He knew Indian ways and speech, Indian skill at living in the dangers and privations of the wilderness. Fate had given him perfect training for the remarkable rôle he was to play in the history of the wild, unknown New World.

Radisson Finds a Partner

When he got back to Three Rivers, he found his widowed sister married to Medard Chouart des Groseilliers, a man as daring and clever as Radisson in woodcraft. In April 1659, some Algonquins were about to return home from Ottawa with 30 Frenchmen and two Jesuits who wished to explore the unknown land of the forests. Radisson and Groseilliers applied to the French governor at Quebec for a license to trap in the *Pays d'en Haut*, the Up Country, as all the land west of the Great Lakes was vaguely called. Their request was refused, but the merchants of Three Rivers, knowing that these two lean black-eyed young men could speak to the Huron, Algonquin, and Erie savages in their own tongues, and had no fear of their arrows and guns, secretly supplied the pair of adventurers with goods for trade. They set out with the party of Algonquins and whites, were attacked

LA VÉRENDRYE EXPLORES THE UPPER MISSOURI



Friend of the Mandans, explorer of the upper Missouri River, Pierre Gaultier de Varennes, Sieur de la Vérendrye, was one of the heroic French-Canadians who founded trading posts for the Hudson's Bay Company, and thus opened the west to settlers.

by the Iroquois, and all the white men but Radisson and Groseilliers were frightened back. Onward these two pushed. With a tin mirror or a few beads they hired Indian guides. With guns and bullets and finery they bought furs and more furs. While Radisson explored, Groseilliers stayed in camp and traded, and startled the Indians with his big black beard, the like of which they had never seen, they said, except on the Spaniards down the great Mississippi River.

Talk of the Great River fired Radisson. On he went across Wisconsin and Minnesota until he reached the Mississippi. He was the first white man to see its northern part and to meet the prairie tribes—the Sioux, Illinois, and Missouri Indians, who conversed in the sign language. Not only did Radisson make this enormously difficult journey to the Mississippi, but he also went overland, through woods and over prairies, from Lake Superior to Hudson Bay. On James Bay, at the very bottom of Hudson Bay, he found "old forts all battered with bullets," which may have been the first forts set up there by Henry Hudson during the bitter winter which caused his crew to mutiny (*see* Hudson, Henry).

After all this wandering in the wilds, among savages from whom most white men would have fled in terror, Radisson and Groseilliers

came dashing back to Three Rivers with the largest flotilla of Indian canoes ever seen on the St. Lawrence. In them was a fabulous fortune in furs, some \$140,000 worth, a great sum in those days. New France was on the verge of bankruptcy. The two explorers had the sanction of neither church nor governor in their expedition. Therefore the monopolists of Quebec pounced on this furry treasure greedily and deprived the pair of most of their wealth. Only \$20,000 was left to Radisson and Groseilliers.

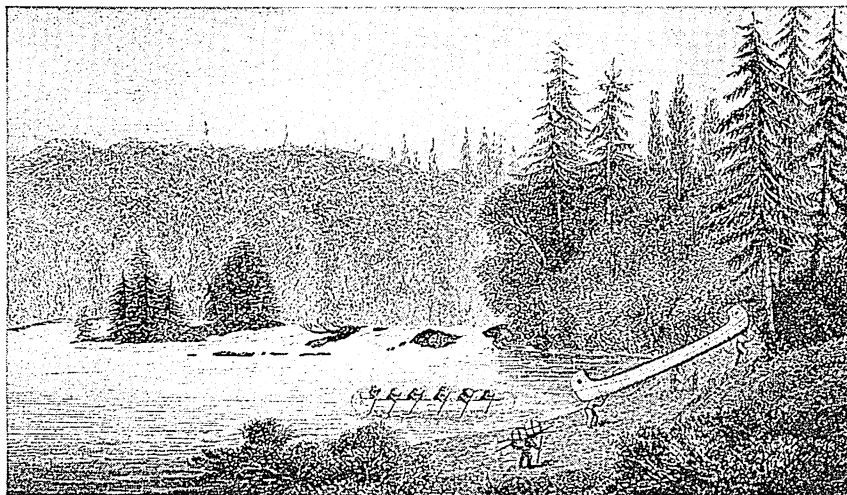
They Call on the English King

It is easy to imagine their rage. After vain appeals to the French court, they tried to recoup their fortunes in various ways, and shortly involved themselves in a lawsuit in Boston over the loss of a hired vessel. In Boston, however, they met Sir George Carteret (Cartwright), one of the English commissioners sent to take over the Dutch colonies for England. Possessing an Englishman's keenness for business, he quickly saw the riches to be gained through these valiant explorers. He invited them to go back to England with him and tell their tale to King Charles II of England. They went, were taken prisoners off their ship by the Dutch, and had just time to drop into the sea all Radisson's precious notes of his travels. They could offer King Charles at Oxford only a word-of-mouth, unprovable, wild story of the opportunities beyond the sea.

The fascinating, almost incredible tale of the two Frenchmen appealed mightily to both King Charles and his cousin, Prince Rupert, Duke of Bavaria, who had valiantly fought for King Charles I, and shared the exile in France of Charles II. Both could talk in French to the two adventurers, and made much of them at court festivals. They became known to the English as Mr. Radisson and Mr. Gooseberry, since the name Groseilliers means in French gooseberry bushes.

Though Charles II and Prince Rupert were short of funds, their courtier friends, delighted with the

WHY STRONG BACKS WERE NEEDED IN THE FUR TRADE



Even the voyageurs stopped their gay French songs when it was necessary to take packs and canoes on the back and "portage." This scene shows the Great Dog portage on the Red River.

adventure of fur trading, organized the Company of Gentlemen Adventurers of England Trading Into Hudson's Bay, one of the "gentlemen adventurers" being a Lady Margaret Drax. The Adventurers bought goods to be used for barter. By 1668, when the two Frenchmen had been in London nearly three years, the king had obtained two rickety ships, the *Eglet* and the *Nonsuch*, for the trip to Hudson Bay. Radisson's ship the *Eglet* was driven back, but Groseillier's returned to the "old forts all battered with bullets" and set up a "Fort Charles" for trade on a stream he called the Rupert River.

When Groseilliers returned in the autumn of 1669, his ship was so crowded with soft, deep, silky furs that the Gentlemen Adventurers must have celebrated with a rousing feast of "roasted pullets" at the Tun Tavern, their favorite rendezvous. Six hundred thousand pelts had their Mr. Gooseberry brought them, all in exchange for a few

trinkets, at a time when rich Englishmen gloried in ermine robes for their royalty, beaver for their hats, lynx skins for their bed covering. No elegant costume was complete without a beaver hat, made by shearing the hair off the beaver fur and felting it.

The Gentlemen Adventurers at once applied for a royal charter of exclusive monopoly of the regions draining into Hudson Bay—a sweeping, preposterous charter granted them in May 1670 (see Hudson's Bay Company). The company had power to govern, to exclude or admit settlers, to make war.

Through all its spectacular career it retained the traits of being "gentlemanly" and "adventurous," which its delightful name implied. The governor at each fort was a little autocrat with absolute power. He could order a lazy or treacherous employee flogged, but if a man lost his toe by frost while snow shoeing through the woods, he would be awarded "four pounds smart money." Gifts large and small were showered on those who did the company favors, gifts of "catt skin counterpanes" for bed covers, "pairs of beaver stockings for ye King," or "gold in a faire embroidered purse," or, to one, "a periwig to keep him loyal."

A Picturesque Scene in the Wilds

When the company was first organized, the scene when furs were bartered was a bright and barbarous display. The white traders, dressed in regimental uniform, with brilliant velvet silk-lined capes flying, marched out with swords a-jingle and bugles and drums playing quick music. They met Indian chiefs, in robes of painted buckskin, wearing strands of precious wampum; or braves with head-dress of eagle

quills streaming quite to the ground, one quill for every enemy conquered. The Indian fell to the ground, and presented the whites with the costly furs of his winter's trapping. The white man smoked the peace pipe, gave thanks to the Sun for meeting the great Indian chiefs, and gave them guns as a gift. They did not speak of buying and selling, but only of gifts.

Into the ships which the company had bought or leased went the furs, into the ships whose selling orders were signed "A God speede, a good will, a

faire sale, y^r loving friends." When the furs reached the loving friends in London, they were sold at a bustling public auction. The auctioneer would stick pins in a lighted candle, and he and the bidders would shout in gusts of oratory and bidding until the candle burnt to each pin, when bids closed.

Beaver Skin Becomes Money

In time, however, as the trade grew, gift giving was abandoned, and the beaver skin became the unit of

measure. A beaver skin was "coin of the realm" until as late as 1820. For one beaver skin the trapper could buy one-half pound of beads, a kettle, a pound of shot, five pounds of sugar, a pound of tobacco, two awls, twelve buttons, twenty fish-hooks, twenty flints, or eight bells. For six skins he could get a blanket, for twelve skins a gun, for four skins a pistol.

On the thrones of France and England in these early days of the Hudson's Bay Company were two of the wildest, shiftiest monarchs in history, Louis XIV and Charles II. Openly friendly, the two nations were secretly trying to outwit each other, particularly in the New World. Poor Radisson, honest and brave himself, was buffeted between these two royal rascals, sometimes going over to the French in rage at English deceits, sometimes patching it up with the English in the hope that the Hudson's Bay Company would give him justice. They never did, and their greedy behavior toward Radisson, the courageous explorer who had made possible all their wealth, is the one great blot on the record of these "gentlemen" adventurers, usually so just and honorable.

It is not possible to follow in brief space all the conniving which went on between the French and English fur traders while France and England kept up the war for mastery in America. The fur struggle and the land struggle continued between the two nations until 1763. One might think that, with Canada in English hands, the troubles of the Hudson's Bay Company were over. But the most bitter and bloody fighting of its history lay ahead as new rivals appeared on the scene.

Roving the wild "Up Country" were some 2,000

A HUDSON'S BAY POST IN MINNESOTA



In the old days of the fur trade northern Minnesota was a trapper's paradise. This old trading-post of the Hudson's Bay Company, in Itasca Park, Minnesota, still stands.

coureurs-de-bois and *voyageurs* of the old French fur trade. The former, "wood-runners," were men who had learned Indian ways and trails, and set out with canoes full of goods to trade for furs. The latter, "travelers," were experts in knowledge of waterways, shooting the rapids, portaging heavy loads. They hired out their skill to merchants or to anyone traveling in the wilderness. In later years the two terms were used almost interchangeably, as the *coureurs* ceased to trade on their own account and served chiefly as *voyageurs*. These men, who knew every stick and stone from Quebec to the Rockies, were left at a loose end when Canada came under British rule. As they drifted back to Quebec and Montreal, they found canny Scottish merchants, ready with fur trading proposals and stocks of goods, and now unhampered by the necessity of getting a license from a French governor. There were the McGillivrays and McTavishes and MacKenzies and MacLeods and MacGregors, small merchants or peddlers, who in 20 years built up vast fortunes. The Scotchmen pooled their interests and in 1783 organized the North-West Fur Company, known to dubious fame as "the Nor'westers," many of them unscrupulous and cruel.

The Fierce Struggle for Furs

Among the intrepid leaders of the Nor'westers were such men as Sir Alexander MacKenzie, the discoverer of the MacKenzie River; Simon Fraser, discoverer of the Fraser River; David Thompson, who found the way down the Columbia south of what is now the Canadian border. The Nor'westers paralleled every fort built by the Hudson's Bay Company.

Then followed the most murderous, wicked era ever known in all the fur trade of North America. It lasted from about 1789 to 1821.

It was in a no-man's-land beyond the reach of law. Trappers and traders swarmed over the whole Northwest, and in vain did the Hudson's Bay Company roar that they had sole rights in their domain. They were as powerless as the king who struck at the gnat with his golden scepter.

All the traders played a game of enticing the Indian trappers from each other. The Hudson's Bay Company might have outfitted an Indian on credit during several lean years, and taught him to trap properly. A Nor'wester or a Mackinaw man would then get the Indian tipsy and buy his furs cheap, or perhaps outbid the Hudson's Bay price. Then the Gentlemen Adventurers would drop down on a Nor'wester fort and raid it for the furs which they considered had been virtually stolen. Meanwhile the people of the United States, pouring

out over the Alleghenies and Appalachians into their new western lands, necessarily began to take more active interest in the fur trade. A little, sharp, shrewd, rotund German-American, John Jacob Astor, who had begun as a "peddler" dealing in trinkets to barter for furs, plainly saw that the Hudson's Bay Company and the Nor'westers were both undergoing heavy losses in their strife. He had organized the American Fur Company, and amassed a fortune. He went up to Montreal, shortly before the War of 1812, and sought to ally the Nor'westers with his own company, and put an end to rivalry with the Hudson's Bay Company. The haughty Nor'westers laughed at him. But there were a number of dissatisfied Nor'westers whom he engaged for his new Pacific Fur Company, which was to send ships around the Horn and up to Alaska, and plant a powerful fort, Astoria, at the mouth of the Columbia, in defiance of all rivals.

Misfortune and Massacre

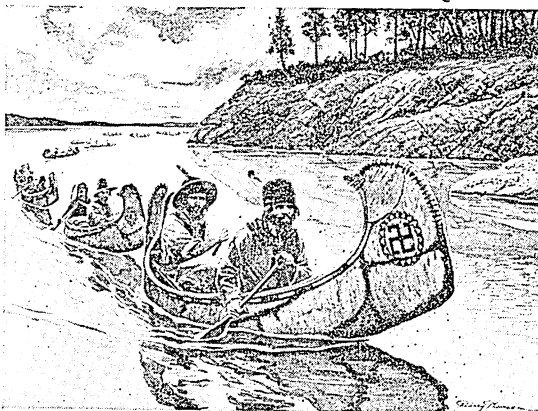
Not lack of pluck, but lack of luck, brought disaster to his enterprises, as in the tragic voyage of the *Tonquin*, made famous by Washington Irving. The *Tonquin* set out from New York in September 1810, with Capt. Jonathan Thorn, of navy traditions, loathing his passengers. He entered the mouth of the Columbia in March 1811, and landed the most troublesome of the Nor'westers, who proceeded to squabble about the building of the new Fort Astoria. On sailed Thorn, more and more nettled by the rough Nor'westers. Contrary to their earnest advice, he allowed several canoes of Nootka Indians to come aboard off the west coast of Vancouver Island. The braves traded their furs for knives and guns, then turned on the white men and massacred them in cold

blood on deck or tossed them, wounded, to the knives of the waiting squaws. A few took refuge under the hatches, and in desperation blew up the vessel, all going down in a ruin of blood and flame.

This was only the first of the mishaps to Mr. Astor's plans. Meanwhile, other American companies had been springing up. Manuel Lisa, a New Orleans Spaniard, began to trade for furs with the Osage Indians about St. Louis, organized the Missouri Company, and so inaugurated the leader-

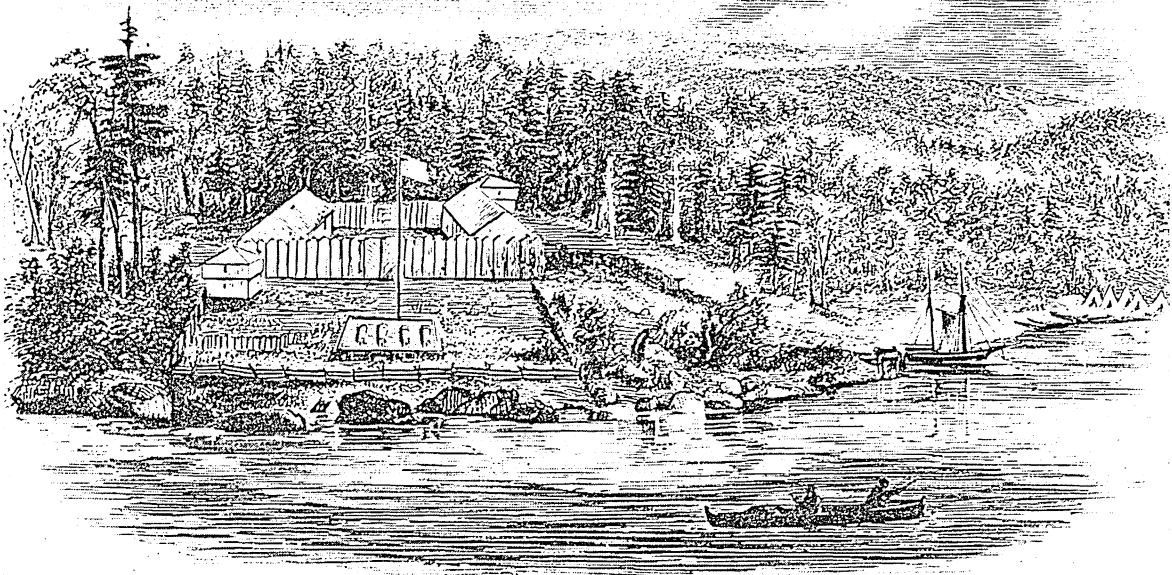
ship of St. Louis in the fur trade. His men traded in the dangerous country of the Blackfeet, near the Three Forks of the Missouri, and each 200 trappers had to be accompanied by an armed force of 50 men to fight the savages. When Lisa died, in 1820, his men flocked to another organization which became known as "the Rocky Mountain Men," famous for treachery.

THE FUR FLEET SWINGS INTO QUEBEC



This illustration from Harold Rugg's 'A History of American Civilization: Economic and Social' (Ginn), shows the trappers' canoes approaching Quebec.

OLD ASTORIA, A MEMORABLE FORT IN THE GREAT FUR WAR



Thus did Fort Astoria, built by John Jacob Astor at the mouth of the Columbia River in Oregon, bristle with four cannon in 1813. Here ruled peppery little Duncan MacDougall, in command for Astor. To check the Indians who might creep up through those thick woods he showed them a small bottle and threatened to "let the smallpox out of it" if they were unfriendly.

Before that time, however, the War of 1812 had put a new face on the situation. Not long after the war broke out, a British gunboat captured Fort Astoria, an easy victory because the ex-Nor'westers in charge of the fort had no heart in a fight against the British. Astor, beaten for the time, continued to finance American companies from St. Louis, and these subsequently split up in American brigades that gave the Hudson's Bay brigades many a losing season in the Rockies, where Americans knew their way about.

Foreign Traders Excluded

Also, in 1816, the American Congress ruled all foreign traders off of United States soil, and the Nor'westers' posts in the United States fell to Mr. Astor's American Fur Company, a satisfactory revenge for their coup at Fort Astoria. The Nor'westers had previously received another blow from the Hudson's Bay Company. Lord Thomas Douglas Selkirk, with large holdings of Hudson's Bay shares, planted on Red River a colony of Orkney Island settlers, ostensibly to buy crops for inland Hudson's Bay forts. The Nor'westers hotly resented the settlers, and their plain rangers caught the local Hudson's Bay governor of Fort Douglas (now Winnipeg) and massacred him and his company to the last man.

Selkirk, distrusting Canadian courts, marched a company of Swiss soldiers, veterans of the Napoleonic wars, up to the Nor'westers' stronghold, Fort William, on Lake Superior, and captured it. He then sent more Swiss back, via the ice of the Red River, to Fort Douglas and recaptured this from the Nor'westers. But such proceedings were too much like a civil war

for the British government to ignore. Neither company could stand a trial in the courts of London or Canada. The government of Canada, through a quiet hint from Great Britain, notified both the Nor'westers and Hudson's Bay Company that unless they composed their differences they might both have their charters rescinded. So the two great rivals became the united Hudson's Bay Company, celebrating the union with a glum banquet at which the traders of the two old companies glared across the table at each other in unspoken hate.

In the United States the stream of settlers and trappers pouring into the west had, by 1831, become a flood. There were Frenchmen from Quebec, with Indian wives; gaunt New Englanders in unfamiliar buckskin; adventurers of all kinds, following the old Rocky Mountain men stealthily about to learn mountain woodcraft and outwit them at obtaining furs. Astor placed Kenneth MacKenzie, an old Nor'wester who could not stomach the union with Hudson's Bay, in charge of Fort Union at the mouth of the Yellowstone. MacKenzie ruled the place like a little king, dazzled the Indians with his bands of drums and trumpets and fifes, and quashed the last hopes of the Rocky Mountain men, whose forts he obtained.

Settlers Replace Trappers

But the tide of settlers was too great. Gradually the wild country became too tame for the great fur trade of the past. Fort Union passed into the hands of the federal troops, and the trappers of the Rocky Mountain regions grew fewer and fewer. The strange heroic rôle of the trapper in history had been played.

He had found the trails which the settlers followed. He had explored and named the lakes and streams and hills. He had learned how to deal with the Indians, so that their full fury was never unleashed upon the settlers, as the history of Canada well proves. He released a primitive source of wealth which built nations.

Today the fur trade operates on less spectacular lines, for the most part, though in the wilds of northern Canada the Indians still trap for the Hudson's Bay Company on the same paternal basis as of old. Strange to say, more furs are now exported from Canada and the United States than in the palmiest days of the old fur trade. One little banking center in western Wyoming has sent out in

one year \$600,000 worth of furs, more than Radisson's ships ever carried back to London. No doubt one reason is that furs are no longer the exclusive wear of the rich, but there is a vast demand for cheaper pelts to make popular moderately priced garments.

Though its annual catch of furs is greater than that of any other country, the United States normally imports even more than it produces. Chief imports are squirrel, hare, fitch, and ermine from Russia; coney and rabbit from Australia; mink and marten from Canada; weasel and lamb from China.

Fur Markets

New York City and St. Louis are the leading markets for both dressed and undressed furs. Until recent years the centers of the fur industry were London and Leipzig.

Fur ranching in the United States and Canada is an increasingly important source of furs. Ranches raise chiefly mink, silver foxes and other foxes, muskrats in

the marshes of Louisiana and elsewhere, and rabbits. As the Louisiana alligators die off, the muskrats increase, and some 6,000,000 are taken annually to meet the great demand for "Hudson seal" coats. Alaska is the great fur country for the United States, and the natives find trapping an important means of livelihood.

The world over, but especially in Canada, Siberia, China, and Australia, men are seeking furs; and garment-makers are showing greater and greater skill in giving beauty and smartness to coats of the simpler, inexpensive furs which an old Nor'wester would have scorned to use for cap or mittens. Tanning and dyeing have likewise improved enormously since the days when the Nor'wester

required the open spaces and a brisk cold wind to make the wearing of his fur garments tolerable.

Cutting and Fitting Furs

To give evenness of color, remove the trace of damage to skins, and advance good lines and beauty, the skins are cut and slashed in a way to horrify a layman, and resewed with endless seams. Such cutting and sewing is today a notable and well-paid handicraft. Never has such a wide variety of furs been used, and the fanciful trade names under which many simple bunnies and bobcats appear is puzzling to the purchaser. It is natural, now that furriers have learned how to prevent skunk fur from giving off a lively aroma on a warm day, to

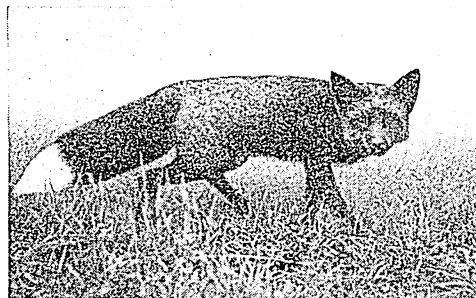
wish to give it a new lease on popularity under the kinder name of "Alaska sable." A list of furs with their trade names will be found with the entry Furs in the Fact-Index. (See also Traps and Trapping.)

WHERE FURS ARE STORED IN UNGAVA LAND



In this lonely wooden house, insulated with snow blocks, lives a factor of the Hudson's Bay Company in Ungava Land, on the east rim of Hudson Bay. The bell rings, calling the Indians to worship, or it sounds an alarm when the wild north has brought danger. Few of civilization's comforts reach these outposts of the fur trade.

A FINE SPECIMEN OF SILVER FOX



The powdering of silver in the fur on the back and face, the white tail tip, and deep glossy fur are what make a silver fox pelt valuable.




THE EASY REFERENCE FACT-INDEX

GUIDE TO ALL VOLUMES FOR SUBJECTS
BEGINNING WITH

F

TO SAVE TIME

USE THIS INDEX 

EDITOR'S NOTE ON NEXT PAGE TELLS WHY

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Numerous other lists and tables in the fields of geography, history, literature, science, mathematics, and other departments of knowledge will be found with their appropriate articles in the main text

EDITOR'S NOTE

EVERY user of Compton's Pictured Encyclopedia should form the habit of *first* turning to the Fact-Index section at the end of each volume when in search of specific information. This index is a miniature work of reference in itself and will often give you directly the facts, dates, or definitions you seek. Even when you want full treatment of a subject, you will usually save time by finding in the index the exact page numbers for the desired material.

All page numbers are preceded by a letter of the alphabet, as A-23. The letter indicates the volume. If two or three page numbers are given for the topic you are seeking, the first indicates the more general and important treatment; the second and third point to additional information on other pages. Where necessary, subheadings follow the entry and tell you by guide words or phrases where the various aspects of the subject are treated.

The arrangement of subheadings is alphabetical, except in major historical and biographical entries. In these the chronological order is followed.

The pictures illustrating a specific subject as a rule appear on the same pages as the text to which you are referred. But often illustrations placed elsewhere will prove of additional interest and value. These are indicated by the word *picture* followed by a page number.

A picture reference is frequently intended to call attention to details in the text under the illustration as well as to the illustration itself. This picture-text, therefore, should always be carefully read.

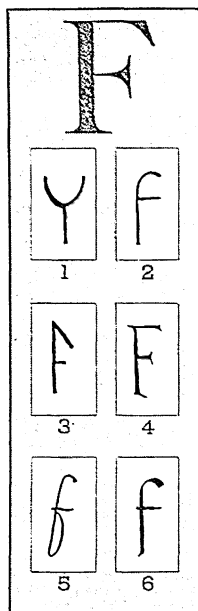
The pronunciations given are those preferred by the best and most recent authorities; alternative pronunciations are indicated only where usage is equally divided. For foreign names the native pronunciation is given except where the English pronunciation has become thoroughly established, as in "Paris," "Barcelona," "Seine."

In recent years hundreds of foreign geographical names have been changed, either officially or by custom. Both old and new names are given at the appropriate places in the alphabet.

Populations are given in round numbers, except for places in the United States and Canada, where the figures are those of the latest official census. Distances between points are map or air distances, not distances by railroad.

THE EASY REFERENCE FACT-INDEX

Reg. U. S. Pat. Off.



OUR LETTER F probably began its history as a sign for the sounds of 'v' and 'w', as told in the history of the letter V. (The letter F is closely related to V, as you can see if you closely observe the movement of the lips in pronouncing 'fee' and 'vee'. The 'fee' pronunciation is called soft, and the 'vee' is called hard, or voiced.) In Hebrew the letter was called *waw* or *vav*; other Semitic languages had similar names. The usual early form was that seen in the Canaanite-Phoenician alphabet (1).

When the Greeks learned how to write from the Phoenicians, they made varying use of the letter. The eastern or Ionic Greeks needed a sign for the 'f' or 'v' sound; but they considered this sound as a sort of 'p', as is shown by their names *phi* and *pi* to mean 'f' and 'p'. (The Greek *phi* survives in English spelling in such words as 'Phoenician' and 'philosophy'. The eastern use of the *vav* sign is explained in the Fact-Index article on the letter V.) But the Thebans, the Chalcidian colonists in Italy, and other western Greeks used the sign for the soft version of the *vav* sound. The Chalcidians also gave the little top marks a sideways position (2). The Romans took over the 'f' pronunciation for the sign, and straightened its curves (3). The final Latin form (4) of the capital letter came into English without change.

Our small 'f' took shape in late Roman and early medieval times when writers began to use a continuous curving stroke, making the top stroke first, then the down one, and finally the lower side stroke, as in 5th-century Latin writing (5). A more carefully made 9th-century version (6) gave rise to our printed small 'f'.

NOTE.—For the story of how alphabetic writing developed from its beginnings, see the articles Alphabet; Writing.

FAA (Federal Alcohol Administration) R-146g

Faber, Cecilia Böhl von. See in Index Caballero, Fernán

Faber (fā'bēr), Frederick William (1814-63), English theologian and hymn writer; follower of John Henry Newman; joined Roman Catholic church 1845; founded religious community, the Wilfridians, which later merged in the Oratory of St. Philip Neri; wrote 'Pilgrims of the Night', 'There's a Wideness in God's Mercy', and other hymns.

Faber, Jacobus. See in Index Lefèvre d'Étaples

"Fabian (fā'bi-ān) policy" H-211

Fabian Society, a socialistic society organized in London in 1883; the "Fabian policy" of delay before action is advocated, also gradual improvement instead of revolutionary measures in socialism: S-181

Fa'bius (Quintus Fabius Maximus) (died 203 B.C.), Roman general H-211

Fables

Aesop's A-28: Locke's estimate L-158

Hindu I-41-2

Fabliau (fā-blē-ō'), medieval French verse tale N-181

'Canterbury Tales' C-161, 162

Fabre (fā'brū), Jean-Henri (1823-1915), French entomologist and author F-1-2

Fabricated ship S-126

Fabricius (fā-brish'i-ys), Hieronymus (hī-ēr-ōn'i-mys) (1537-1619), Italian anatomist and surgeon; taught anatomy and surgery at the University of Padua for half a century; his observations of valves of veins led to discoveries on blood circulation by William Harvey, his pupil ('Opera Chirurgica').

Fabrics. See in Index Cloth; Textiles; and principal fabrics by name

Fabrikoid, a synthetic leather-like material P-245f

Façade (fā-sād'), in architecture, the

outside face or elevation of a building; usually the front or chief face; there may be rear or side façades.

Face, human

bones of S-156

development of C-198

Face brick B-238

Face-maker, a monkey M-229

Face value, or par value, of stocks and bonds S-290

Facsimile message, in telephotography T-34, 42

Factor, of a number, one of the numbers whose product is the number in question

algebra A-124

arithmetic A-236

fractions F-169

"Factories," name given to trading posts of Hanseatic League H-212

Factories and factory laws F-2. See also in Index Labor; Safety

Arkwright's factory A-300

automobile A-390-1, D-56, F-153

Berlin B-99

child labor laws C-205, F-2

China C-221c

city growth aided by C-240

clothing industry C-278

electric power, changes due to E-237, I-74m

employers' liability E-263

England E-275-6, 278, 280

Industrial Revolution I-74b-d, g

inspection H-254, 257

Italy, 16th century, picture I-74a

Japan J-188b, c

labor movement L-43-5

location of C-240

mass production E-150-1

psychology in industry P-361

safety S-2a, c

shoe industry S-131-2

sweatshops S-334, C-277-8

Faculae (fāk'ū-lē), on sun S-328

Fadiman, Clifton (born 1904), editor and literary critic, born Brooklyn, N.Y.; became master of ceremonies on noted radio program 'Information Please' 1938; book editor *The New Yorker* 1933-43.

Fading, in radio R-25

Faer (fād), John (1819-1902), Scottish artist; works include miniatures and Biblical paintings.

Faer, Thomas (1826-1900), Scottish painter, brother of John; best known for Scottish domestic scenes.

Faenza (fā-ēnt'sā), Italy, city 19 mi. s.w. of Ravenna; pop. of commune, 40,000; 15th-century cathedral faience pottery P-331

'Faerie Queene', allegorical romance by Edmund Spenser E-234

quoted A-282

Spenser reading, picture R-49

Faeroes, The, or Faroe Islands, known as "Sheep Islands," Danish group between the Shetland Islands and Iceland; 540 sq. mi.; pop. 25,000; fishing, sheep raising: D-53-4, map E-326d

Fafnir (fāv-nēr'), in Norse mythology, a dragon; guardian of the treasure later known as the Nibelung hoard

Siegfried slays S-141

Fagaceae (fā-gā'sē-ē). See in Index Beech family

Fagging, a system in English public schools under which younger boys render services to older boys, such as running errands, etc.

Fa'gin, a crafty old Jew, thief-trainer, and receiver of stolen goods in Dickens' 'Oliver Twist'.

Faguet (fā-gā'), Emile (1847-1916), French critic and man of letters; elected to Academy 1901; professor of poetry at Sorbonne ('Notes sur le théâtre contemporain').

Fahrenheit (fā'rēn-hit), Gabriel D. (1686-1736), German physicist and instrument maker; introduced the use of mercury in thermometers; devised Fahrenheit scale: T-78

Fahrenheit thermometer T-78

Faience (fā-yāns'), a variety of pottery P-331

Faille (fāl, French fā'yā), a ribbed silk dress fabric; softer and with wider, flatter ribs than grosgrain.

Fainting
treatment F-66

Fair'bairn (*fēr'bērn*), Sir William (1789-1874), Scottish engineer and inventor; a pioneer builder of iron ships in Great Britain; with Robert Stephenson, built tubular bridge over Menai Strait.

Fairbanks, Charles Warren (1852-1918), American politician; U. S. senator from Indiana 1897-1905 vice-president, *table* V-392

Fairbanks, Douglas (1883-1939), noted American motion picture actor and producer, born Denver; first appearance on stage 1901; married Mary Pickford in 1920, divorced 1935 ('The Three Musketeers'; 'Robin Hood'; 'The Thief of Bagdad'; 'The Iron Mask').

Fairbanks, Thaddeus (1796-1886), inventor of compound-lever platform scales; founded, with his brother Erastus (1792-1864), E. & T. Fairbanks & Co.; born Brimfield, Mass. scales W-65

Fairbanks, Alaska, on Tanana River, largest town in interior; pop. 3455; supply point for territory within 300 miles, reached by airplane; gold mining, coal mining, fur farming; University of Alaska; government experimental farm; U. S. Army air base: *maps* A-105, C-50b University of Alaska A-104

Fair Employment Practices Committee N-12r

Fairfax, Thomas, Baron (1612-71), English general under Cromwell; victor at Naseby over Charles I (1645).

Fairfax, Thomas, Baron (1692-1782), American colonist, born England; owned "Northern Neck" and Shenandoah Valley of Virginia (nearly one-fourth of present state) bequest to Virginia W-74 Washington employed by W-14

Fairfield, Ala., industrial suburb of Birmingham; pop. 11,703; coal, iron and steel products.

Fairfield, Conn., summer resort and manufacturing town on Long Island Sound, 51 mi. n.e. of New York City; pop. 21,135; chemicals, cast aluminum, fabrikoid; Indian and Revolutionary War battles; burned by Hessians and Tories in 1779.

Fairhaven, Mass., city opposite New Bedford on estuary of Acushnet River, at head of Buzzards Bay; pop. 10,938; once part of New Bedford, incorporated as Fairhaven in 1812; whaling was once important industry here; boat yards.

Fair Labor Standards Act of 1938 L-44d child labor C-205 sweatshop methods and S-334

Fairmont, W. Va., city 55 mi. s.e. of Wheeling; pop. 23,105; glass products, fiber board, coal, mining machinery; state teachers college.

Fairmount Park, Philadelphia P-160

Fair Oaks, battle of (also called Seven Pines), a bloody engagement fought 7 mi. s.e. of Richmond, Va., May 31-June 1, 1862, between Unionists under McClellan and Confederates under J. E. Johnston: *map* C-253

Fairs and expositions F-3-5. *See also in Index* Market agricultural, in U. S. A-54 Chicago: Century of Progress (1933-34) C-191; Columbian Exposition (1893) C-190, C-267, *picture* F-5 Cleveland: Great Lakes Exposition (1936-37) F-5 Colonial International Exposition, Paris (1931) F-5, *picture* F-4 county and state fairs F-5

Dallas: Texas Centennial Central Exposition (1936-37) D-6 International Livestock Exposition. Chicago F-165 Leipzig fairs (Germany) L-93 London: Crystal Palace Exhibition (1851) F-4 Lyons, France, international L-224 medieval fairs F-3, R-76, 77 New York City (1939-40) F-5, *pictures* F-4b Nijni-Novgorod, Russia R-182, *picture* R-188 Paris: Colonial International Exposition (1931) F-5, *pictures* F-4; World's Exposition (1889) P-74 Philadelphia: Centennial Exposition (1876) P-160; Sesquicentennial Exposition (1926) P-160 Portland, Ore.: Lewis and Clark Exposition (1905) P-307 St. Louis: Louisiana Purchase Exposition (1904) S-10 San Diego: Panama-California (1915-16) and California-Pacific-International (1935) expositions S-24 San Francisco: Panama-Pacific International Exposition (1915) S-25; Golden Gate International Exposition (1939-40) F-5, S-25, 26, *pictures* F-4a Seattle. *See in Index* Alaska-Yukon-Pacific Exposition (1909) Seville: Ibero-American Exposition (1929) F-5 state and county fairs, U. S. F-5: 4-H Clubs F-165 Toronto: Great National Expositions F-5 trade fairs, or markets F-3-4 Fairway, in golf G-116 Fairweather, Mount, volcanic mountain of St. Elias range in s.e. Alaska; peak (about 15,300 ft.) on Alaska-British Columbia border: *map* A-105 Fairy F-3, *pictures* S-300, M-162 Irish folklore I-132, F-3 Fairy-fly A-203 Fairy lilies. *See* Zephyranthes Fairy ring M-306 Fairy stone. *See in Index* Staurolite Fairy tales S-303a-p. *See also in Index* Folk-tales Andersen A-194, L-160 'Arabian Nights' A-243-5 'Blue Bird' M-24 first fairy tales L-158, *pictures* L-159 Grimm's L-159-60, S-301, *picture* L-161 Lagerlöf L-55 'Midsummer Night's Dream' M-162 'Peter Pan' B-51 'Fairy Tales from Canada', by Cyrus Macmillan, story from F-136-9 Faisal, or Feisal (*fī'sāl*) (1885-1933), Arab Emir, son of King Husein of Hejaz; leader in Arab revolt (1916); commanded n. Arabian forces in first World War; represented Arabia at Peace Conference king of Iraq I-123 Lawrence and L-75 'Faith', a Little Talk by Arthur Mee F-6 Faiyum (*fī-ygm'*), El, province of Upper Egypt on w. side of Nile; 670 sq. mi.; pop. 600,000; noted for fertility; cap. El Faiyum (Medinet el Faiyum), pop. 64,000; market for fruits, rice, cotton: E-195, *map* E-197 Fakirs (*fā-kērz'* or *fā'kērz'*), religious ascetics of India B-259, *picture* I-36 self-hypnosis H-378 Falaize (*fā-lēz'*), a town in n.w. France; pop. 5000; ruined castle, birthplace of William the Conqueror. Falange, fascist party of Spain,

founded 1933; became the only legal political party in Spain in 1939; after General Franco's victory in the civil war; members of party called Falangists.

Falashas (*fā-lū'shūz*), a Hamitic people of Ethiopia who profess the Jewish religion and claim descent from Jews who followed the Queen of Sheba.

Falconbridge, Sir (William) Glenholme (1846-1920), Canadian jurist, born Drummondville, Ontario; chief justice of Ontario 1900-16; knighted 1908.

Falconer (*fā'k-nēr*), Sir Robert Alexander (1867-1943), Canadian educator and clergyman, born Charlottetown, Prince Edward Island; president of Toronto University 1907-32 ('Idealism in National Character'; 'Citizenship in an Enlarging World'; 'Religion on My Life's Road').

Falconet (*fāl-kō-nē'*), Etienne Maurice (1716-91), French sculptor; best known for colossal equestrian statue of Peter the Great (in Leningrad) and the 'Bathing Girl' (in Louvre, Paris).

Falconiformes (*fāl-kō-nī-fōr'mēz*), an order of predatory birds, comprising vultures, kites, eagles, hawks, ospreys, falcons.

Falconio (*fāl-kō'nyō*), Diomedes, Cardinal (1842-1917), Italian-American Roman Catholic prelate; apostolic delegate to Canada 1899-1902, to U. S. 1902-11; made cardinal 1911.

Falcon Island, small volcanic island of the Tonga group in South Pacific; first sighted by British navy vessel *Falcon* in 1865; has since disappeared a number of times.

Falconry (*fā'k-ōn-rī*), or hawking F-7, H-246 *picture* H-247

Falcons H-246 sparrow-hawk, *color plate* B-135 *picture* H-247

Falguière (*fāl-gyēr'*), Jean Alexandre Joseph (1831-1900), French sculptor and painter; sculptures are robust and realistic ('Diana'; monument to Lafayette; 'The Dance'); paintings show influence of Goya ('Wrestlers'; 'Spanish Dwarfs').

Faliero (*fā-lē-yā'rō*), or Falier Marino (1279?-1355), doge of Venice (1354-55), conspired to make himself sovereign; executed; subject of dramas by Byron, Swinburne, and others.

Falkenhayn (*fāl'kēn-hīn*), Erich von (1861-1922), German general; served in China 1900-03; Prussian minister of war 1913; succeeded von Moltke 1914 as chief of general staff of German army; failure of attacks on Verdun caused his retirement in favor of von Hindenburg: W-157, 159

Falkirk (*fāl'kērk*), Scotland, town 17 mi. e. of Glasgow; pop. 37,000; iron casting, cattle market.

Falkirk, first battle of (1298) Wallace defeated W-5

Falkirk, second battle of (1746), Highlanders under Prince Charles defeated English under General Hawley.

"Falkland, Samuel," pen name. *See in Index* Heijermans, Herman

Falkland Islands, a British colony near tip of South America in South Atlantic Ocean; pop. 3000: F-7, A-217, *maps* S-208c, A-214 battle in first World War F-7, W-158

Falköping (*fāl-chāp'ing*), small town in s. Sweden; victory (1389) of Margaret, queen of Denmark and

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wón, fōr, nōt, dō; cūre, būt, rýde, fūll, bārn;

- Norway, over king of Sweden, resulting in union of the three kingdoms.
- Fall, Albert Bacon (born 1861), American legislator, born Frankfort, Ky.; senator from New Mexico (1913-21), secretary of interior under President Harding oil scandal H-220
- Fall, in wrestling W-182
- Falla (*fäl'ya*), Manuel de (born 1876), Spanish impressionist composer; came under influence of Debussy and Dukas in Paris; leader of modern Spanish composers (opera, 'La Vida Breve'; ballet, 'Three-Cornered Hat'; symphonic poem, 'Nights in the Gardens of Spain'): M-316
- Fallada (*fä-lä'dä*), Hans, pen name of Rudolf Ditzgen (born 1893), author, born Pomerania, Germany ('Little Man, What Now?'; 'The World Outside').
- Fallen arch, of the foot F-148
- Fallen Timbers, battle of, on Maumee River, 15 mi. from Toledo, Ohio; Indians defeated by Anthony Wayne (1794), leading to Treaty of Greenville: W-59
- Fallersleben, Hoffmann von. *See in Index* Hoffmann, August H.
- Fallières (*fäl'yér'*), Clément Armand (1841-1931), president of France 1906-13; previously held various cabinet positions and was president of Senate 7 years; interested in aiding working classes.
- Falling bodies, law of G-142, P-190
- Galileo's experiment G-1, 2, G-142, picture G-143
- in a vacuum A-62
- Falling stars, or shooting stars, popular term for meteors M-126-8. *See also in Index* Meteors
- Fall line, in physiography, the line separating a piedmont plateau from a coastal plain; applied particularly in eastern U. S. because the rivers crossing this point descend in rapids; large cities located on fall line because it is the head of navigation and the falls provide water power
- Alabama A-96
- Baltimore, Md. B-33
- Georgia G-55
- North Carolina N-156
- South Carolina S-212
- Fallon, Nev., town 58 mi. n. e. of Carson City; pop. 1911; seat of Churchill County; stock-raising center; Lahontan Dam near by.
- Fallo-plus, or Fallopio, Gabriello (1523-62), Italian anatomist; taught in Ferrara, Pisa, and Padua; made many important anatomical discoveries ('Observationes Anatomicae').
- Fall River, Mass., one of greatest textile centers; 49 mi. s. of Boston; pop. 115,428: F-7, map M-82
- Falls. *See in Index* Waterfall
- "Falls City," name given Louisville, Ky. L-209
- Falls of St. Anthony, in Mississippi River, at Minneapolis discovered by Hennepin H-274, M-194
- water power M-190
- Falmouth (*fäl'müth*), England, seaport and winter resort in Cornwall at mouth of Fal River; pop. 13,000; Pendennis and St. Mawes castles: map E-270a
- False acacia, name applied to the American locust tree A-4, L-179
- leaf, pictures L-89, L-179
- False chamomile, common name for boltonia. *See in Index* Boltonia
- False Demetrius. *See in Index* Demetrius
- False dragonhead. *See in Index* Physostegia
- False hemp. *See in Index* Sunn
- False indigo. *See in Index* Baptisia
- False rib. *See in Index* Rib
- False Solomon's-seal. *See in Index* Solomon's-seal
- False starwort, a common name for the boltonia or false chamomile. *See in Index* Boltonia
- False sunflower. *See in Index* Helioopsis
- Falstaff (*fäl'stäf*), Sir John, genial, dissolute "fat knight," boon companion of wild Prince Hal in Shakespeare's 'Henry IV' (I and II) and comic butt in the 'Merry Wives of Windsor'.
- 'Falstaff', opera by Verdi V-282
- Fal'ster, island of Denmark, 30 mi. long, renowned for its orchards; pop. 45,000: D-52, map D-53
- Fame, Hall of H-201-2, picture N-132
- Famille jaune (*fä-mé'yü zhōn*), a Chinese porcelain P-331
- Famille noire (*nwār*), a Chinese porcelain P-331
- Famille rose, a Chinese porcelain P-331
- Famille verte (*vért*), a Chinese porcelain P-330-1
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- Family and tribal life F-8-12. *See also in Index* Home life
- agricultural stage F-10-11
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- strange customs S-183
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- Family budget H-326
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- thrift T-87
- Family Compact, a political clique in Canada C-60, M-12
- Family names, origin of N-2
- Famine, extreme scarcity of food, caused by drought, insects, etc.
- Ireland I-127
- potato a factor in P-324
- Fan-back chair A-171
- Fan blower, in ventilation M-188, H-266
- Fan coral, or sea-fan C-362, picture C-363, color plate F-72a-b
- Fandango (*fän-däng'gō*), a national dance of Spain, performed in 6-8 time by two dancers with castanets; slow beginning develops to intense quickness; generally accompanied by music or singing; term also applied to music for the dance.
- Faneuil (*fän'l*), Peter (1700-43), Boston (Mass.) merchant of French Huguenot descent, born New Rochelle, N.Y.; built and gave to Boston as a market and public meeting-place Faneuil Hall, called the "Cradle of Liberty" because Revolutionary patriots met there.
- Faneuil Hall B-202, A-271, picture B-201
- Fang, a tooth or other sharp member with which an animal strikes, seizes, or holds its prey
- snake's V-302-3
- spider's, picture S-255
- Fannin, James W. (1800?-36), Texan patriot, born Georgia; killed at Goliad (1836) with entire force during Texas war for independence.
- Fanning Island, coral island in Pacific Ocean near Equator; belongs to Gilbert and Ellice Islands Colony of Great Britain: map P-10c
- cable station C-9
- Fan palm P-37, picture P-38
- leaf, picture L-89
- Fantail goldfish G-115
- Fantail pigeons P-216
- Fantasia (*fän-tä-zé'ä* or *fän-tä'zi-ä*), a musical composition in which the composer does not confine himself to a fixed form or theme but freely selects airs and movements to suit his fancy.
- Fanti (*fän-té'*), a Negro tribe of the Gold Coast, West Africa, closely related to the Ashanti.
- Fantine (*fän-tén'*), in Hugo's 'Les Misérables', mother of Cosette, befriended by Jean Valjean.
- Fantin-Latour (*fän-tän' lä-tör'*), Ignace Henri Jean Théodore (1836-1904), French painter and lithographer; portrayed many celebrated artists and musicians with delicacy and charm; exquisite flower paintings.
- Fan vaulting, in architecture A-269
- Westminster Abbey L-188
- Farad (named for Michael Faraday), a unit of capacity in electricity E-230
- Faraday (*fär'ä-dä*), Michael (1791-1867), English chemist and physicist F-12, E-232-3
- discovered ions C-172
- electromagnetic induction F-12, E-228, E-215-16
- Tyndall influenced T-172
- Farce, a form of comedy in which plot and situations are exaggerated, the effects often being ridiculous.
- Far East, term applied to easternmost countries of Asia, especially China and Japan, with Manchukuo and Outer Mongolia; in broader sense includes also Siberia, Indo-China, Siam (Thailand), British Malaya, East Indies, and Philippine Islands, and sometimes India and Ceylon.
- Far Eastern Region, or Far Eastern Territory, administrative unit of Soviet Russia in e. Siberia; farming, mining, lumbering: S-139
- Far Eastern Republic, formed in Siberia following first World War; dissolved in 1922 and reorganized as Far Eastern Region: S-139
- Farel (*fä-rél'*), Guillaume (1489-1565), French reformer and preacher in Switzerland
- relations with Calvin C-35
- Fare register (street-car) C-20
- Farewell Address, Washington's (1796) W-20
- Fargo, William George (1818-81), American pioneer expressman, born Pompey, N.Y.; formed first express company west of Buffalo 1844; organized Wells, Fargo and Co. 1851; mayor of Buffalo, N.Y., 1862-66; president American Express Co. 1868-81.
- Fargo (*fär'gō*), N.D., largest city in state, near e. border on Red River; railroad center in agricultural region; pop. 32,580; important distributing point for heavy farm

- machinery, foodstuffs, and automobiles; North Dakota Agricultural College: map N-162
- Fargus, Frederick John** (Hugh Conway) (1847-85), English novelist; first won fame as author in 1883 with novel 'Called Back' ('Dark Days'; 'A Family Affair'; 'A Cardinal Sin'; 'Bound Together').
- Faribault** (*fär'i-bô*), Minn., manufacturing city and educational center 52 mi. s. of St. Paul, pop. 14,527; trucks, furniture, shoes, flour, lumber; gardens and nurseries; state schools for deaf, blind, and feeble-minded.
- Farida**, queen of Egypt (born 1921), daughter of Youssef Zulficar Pasha, judge of a high Alexandrian court; of Circassian and Turkish blood. At her marriage to King Farouk in January 1938, her maiden name, Sasi Naz, was changed to Farida, Arabic for "unique."
- Farinelli** (*fä-rë-nëll'ë*), Carlo, stage name of Carlo Broschi (1705-82), Italian singer, gifted with a marvelous voice, possessing seven or eight notes more than those of ordinary singers; sang in Vienna and England with great success; in Spain relieved melancholia of Philip V by singing; great influence at court.
- Faris, John Thomson** (born 1871), American writer, editor, and clergyman ('Old Roads out of Philadelphia'; 'When America Was Young'; 'The Book of Everyday Heroism'; 'Winning Their Way').
- Farjeon** (*fär'jôn*), Eleanor (born 1881), English writer of poems, stories, and singing games for children; granddaughter of Joseph Jefferson ('Martin Pippin in the Apple Orchard'; 'Ten Saints'; 'Portrait of a Family'; 'The Tale of Tom Tiddler').
- Farley, James A.** (born 1888), American political leader, born Grassy Point, N. Y.; managed President Franklin D. Roosevelt's campaigns as chairman of Democratic National Committee (1932-40); postmaster general 1933-40.
- Farley, John Murphy**, Cardinal (1842-1918), American Roman Catholic prelate, born Ireland; became archbishop of New York, 1902; made cardinal by Pope Pius X, 1911 ('The Life of Cardinal McCloskey').
- Farm** biplane, picture A-70
- Farm bloc**, in U. S. Congress H-219
- Farm Board**, Federal (U. S.), created 1929 F-12, H-336
- Farm Bureau**, or Extension Service, in Department of Agriculture U-228, A-55
- Farm Chemurgic Council** P-245b-c
- Farm clubs**, boys and girls A-55
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- Farm credit** F-12, B-39
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- Farmer-Labor party**, U. S. L-45
- Farmers' Alliance**, a political party in U. S. P-293
- Farmers' cooperative societies**. See in *Index* Coöperative societies
- Farmers' Movement**, in South Carolina S-216
- Farmers of taxes**, in ancient Rome R-134
- Farming**. See in *Index* Agriculture
- Farmington River**, a stream in n. cent. Connecticut flowing about 100 mi. to the Connecticut River, map C-336
- Farm labor**. See in *Index* Agriculture, subhead labor
- Farm land banks** F-12
- Farm lands**. See in *Index* Land use
- Farm life**
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- Farm relief** R-146f, j, m, A-56b-57
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- Farm Security Administration (FSA)** R-146g, U-228
health insurance S-179
- Farm Tenant Act of 1937** C-376
- Farnese** (*fär-nä'zä*), great Italian family, including one pope, Paul III (1468-1549), a great general, Alessandro Farnese (1547-92), and the dukes and princes of Parma. The Farnese name is connected with the celebrated palace in Rome and with several works of ancient art, formerly owned by the family. 'Farnese Hercules', statue H-283, picture S-55
- Farnol, John Jeffery** (born 1878), English novelist, writer of popular adventure stories ('The Broad Highway'; 'The Amateur Gentleman'; 'The High Adventure'; 'Gylford of Weare'; 'Another Day').
- Faroe** (*fä'rä* or *fä'rö*) Islands. See in *Index* Faeroes, The
- Farouk I**, king of Egypt (born 1920), inherited throne at death of father, Fuad I, in 1936, and continued his father's pro-British policy.
- Farquhar** (*fär'kwär* or *fär'kär*), George (1677?-1707), English comic dramatist ('The Beaux Stratagem') D-96
- Far'ragut**, David Glasgow (1801-70), United States naval officer F-12-13
Mobile Bay taken, picture C-255
statue by Saint-Gaudens S-7
- Farrand, Livingston** (1867-1939), American educator, born Newark, N.J.; president University of Colorado, 1914-19, of Cornell University 1921-37; prominent in public health work; editor *American Journal of Public Health* 1912-14 ('The Basis of American History').
- Farrar** (*fär'är*), Frederic William (1831-1903), English author, educator, and clergyman, born Bombay, India; appointed archdeacon of Westminster, 1883, and dean of Canterbury, 1895 ('The Life of Christ'; 'The Life and Works of St. Paul'; 'The Early Days of Christianity').
- Farrar** (*fä-rär'*), Geraldine (born 1882), American dramatic soprano, born Melrose, Mass.; studied Boston, N. Y., Paris, Berlin; won great success in grand opera through dramatic ability ('Madame Butter-
- fly'; Marguerite in 'Faust'; motor picture 'Carmen').
- Farrell, James T.** (born 1904), American author, born Chicago, Ill. ('Studs Lonigan'; 'Father and Son'; 'A World I Never Made'; 'No Star Is Lost'; 'My Days of Anger').
- Farrell, Pa.** (formerly South Sharon), city s. of Sharon, near center of w. boundary; pop. 13,899; steel, iron, tin plate, brass, explosives; coal mining and stone quarrying.
- Farrère** (*fä-rër'*), Claude (pen name of Charles Bargone) (born 1876), French author, born Lyons; for many years officer in French navy; noted for vivid pictures of life on sea and in Orient; won Goncourt prize, 1905 ('House of the Secret').
- Farringford**, Isle of Wight W-97
- Far-sightedness** (hypermetropia) E-352, S-240
- Farther India**. See in *Index* Indo-China
- Farthing**, an English coin, one-fourth of a penny or 1/960 pound; legal tender for small sums.
- Far'thingale**, a hoop skirt D-109
- Farwell, Arthur** (born 1872), American composer, born St. Paul, Minn.; important work in community music, directed municipal concerts in New York and California; especially interested in music of the American Indian and the Negro ('The Evergreen Tree', a mask).
- Far West**, America's last frontier F-13-17, Outline U-204-5. See also in *Index* Pioneer life; Southwest bibliography U-255, 256
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"Buffalo Bill" B-262, F-13, 17
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settlement: California C-34-5; Colorado C-314; Idaho I-9-10; Montana M-243, 246; Nebraska N-60; Nevada N-78; North Dakota N-165; Oklahoma O-215-16, 220; Oregon O-246-8; South Dakota S-219-20
territorial expansion U-241-2, map U-242
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- Fas**. See in *Index* Fez
- Fasces** (*fäs'ez*), Roman symbol of authority
adopted by Fascisti I-158-9, F-17
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- Fas'cieled roots** R-153
- Fascism** (*fäsh'izm* or *fäs'izm*), a political doctrine F-17-18
contrast with Communism C-325
influence on postwar dictatorships D-67d
- Fascist** (*fäsh'ist*) Grand Council, Italy I-160
- Fascisti** (*fä-shës'tä*), organization of 1st World War veterans in Italy

- formed in 1919; gained control of government, their chief Benito Mussolini becoming premier F-17, I-158-9
- Fasher, El (*ēl fū'shēr*), cap. of Darfur province, Anglo-Egyptian Sudan; pop. 14,000; caravan junction: *maps* E-197, A-42a
- Fashion, in dress D-106-13. *See also* in *Index* Clothing; Costume
- Fashoda (*fā-shō'dā*), Anglo-Egyptian Sudan. *See* in *Index* Kodok
- Fast days H-323
- Fatalism, the doctrine that all happenings are foreordained or fixed by fate, that human initiative or will has no power to direct or change the nature or course of events.
- Fata Morgana (*fā'tā mōr-gā'nā*), a fairy in medieval romance, pupil of Merlin and sister of King Arthur; also called Morgan le Fay name given to mirage M-199
- Fates, in Greek mythology F-18
- "Father Abraham." Lincoln.
- Father Millet Cross, a national monument in New York N-22
- Father of Algebra. Diophantus.
- Father of All Scouting. Lord Robert Baden-Powell.
- Father of American Botany. John Bartram.
- Father of American Football. Walter Camp.
- Father of Angling. Izaak Walton.
- Father of Church History. Eusebius of Caesarea.
- Father of Comedy. Aristophanes.
- Father of English History. The Venerable Bede.
- Father of English Poetry. Chaucer.
- Father of Epic Poetry. Homer.
- Father of Geometry. Euclid.
- Father of Greek Tragedy. Aeschylus.
- Father of His Country. Washington.
- Father of History. Herodotus.
- Father of Italian Prose. Boccaccio.
- Father of Lies. Satan.
- Father of Medicine. Hippocrates.
- Father of Music. Palestrina.
- Father of Renaissance Art. Donatello.
- Father of Roman Poetry. Ennius.
- Father of Russian Literature. Lomonosof.
- Father of Song. Orpheus.
- Father of Systematic Botany. Carl von Linné.
- Father of the American Navy. John Barry.
- Father of the American Revolution. Samuel Adams.
- Father of the Constitution. Madison.
- Father of the English Navy. Alfred the Great.
- Father of the Faithful. Abraham; also title of Mohammedan calif.
- Father of Tragedy. Thespis.
- Father of Waters. Mississippi River.
- "Fathers and Sons", novel by Turgenief T-156-7
- Father's Day, holiday celebrated in U.S. and in Canada on third Sunday in June.
- Fathers of Confederation, Canada T-155
- Fath'om, mariners' measure, used for depths of water and lengths of rope, *table* W-67
- Fathom'eter, for ocean sounding O-201
- Fatigue W-147-8
- Fatima (*fāt'i-mā* or *fū'ti-mā*) (606?-632), favorite daughter of Mohammed, wife of Ali, said to be ancestress of Fatimites.
- Fat'imate dynasty, Arabian califs who ruled Egypt, Syria, and n. Africa 908-1169; claimed descent from Fatima: M-216
- conquers Egypt C-14
- Fats F-18-19. *See also* in *Index* Oils blubber W-78
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- oxidation in the body B-110
- peanut contains F-94
- soap making S-175, 177
- storage in the body F-145
- wax distinguished W-58
- Fat-soluble vitamins V-311b
- Fat-tailed. sheep S-106
- Fatty acids, organic acids derived from "open chain" hydrocarbons, combined with glycerin in fats and oils G-108, F-19
- in soap making S-175, 177
- Faubourg (*fō-bōr'*), French term for suburb; sometimes applied to districts that were formerly suburbs, as *Faubourg St. Honoré*, in Paris.
- Faulkner, William (born 1897), novelist, short-story writer, poet, born Ripley, Miss.; writes about the South; interested in psychology of abnormal and vicious characters; style powerful, but often strained ("The Sound and the Fury"; 'Sanctuary'; 'These Thirteen'; 'Green Bough'; 'The Unvanquished'; 'The Wild Palms').
- Faulks, Theodosia. *See* in *Index* Garrison, Theodosia
- Fault, in geology M-292, *picture* G-41
- earthquakes caused by E-135
- Faultless painter (Andrea del Sarto) P-16
- Faun, in Roman mythology, goatlike creature corresponding to Greek satyr P-40
- attended Dionysus D-70
- 'Marble Faun' G-166
- Fau'na, all the animals of a region or of a division of geologic time.
- Faunce, William Herbert Perry (1859-1930), American clergyman, educator, and writer, born Worcester, Mass.; president Brown University 1899-1929 ('The Educational Ideal in the Ministry'; 'What Does Christianity Mean?'; 'The New Horizon of State and Church').
- Fauntleroy, Little Lord, seven-year-old hero of Mrs. Frances Hodgson Burnett's story of that title. His curls and velvet suits set a fashion for small boys.
- Faunus (*fā'nūs*), in Roman mythology, rural god identified with the Greek pan P-40
- Faure (*fōr*), Félix (1841-99), French statesman, president of French Republic 1895-99.
- Fauré (*fō-rā'*), Gabriel Urbain (1845-1924), French composer; director Paris Conservatory; at his best in chamber music and songs.
- Faure, Jean Baptiste (1830-1914), French barytone and composer; sang in opera and concert; best known by songs ('The Palms').
- Faust, or Fust, Johann (died 1466?) German money-lender, associated with Gutenberg in invention of printing P-346, *picture* B-191
- 'Faust', dramatic poem by Goethe G-109-10, F-20, P-368b
- 'Faust', opera by Gounod F-20
- Melba as Marguerite, *picture* O-232
- Méphistophéles, *picture* O-230
- story O-230
- Faust legends F-19-20
- 'Fauves, Les' (the wild beasts), group of French painters who revolted against impressionism; first exhibitions of works 1906; stressed design rather than realistic portrayals; members included Matisse, Roualt, Derain, Dufy, Vlaminck, Braque, and de Segonzac.
- Faversham (*fāv'ēr-shām*), William (1868-1940), American actor, born England; came to U.S. 1888; successful in Shakespearean and other plays; in 1912-14 produced 'Julius Caesar' and 'Othello', playing Antony and Iago; popular also in motion pictures.
- Favored Nation Clause, a treaty provision between nations I-110d, T-13a
- Fawcett (*fā'sēt*), Henry (1833-84), English statesman, reformer, economist, member of Parliament, and postmaster general; inaugurated parcel post and postal savings bank and insurance; blind from age of 25 ('A Manual of Political Economy'; 'Free Trade and Protection').
- Fawcett, Dame Millicent Garrett (1847-1929), English author and political worker, wife of Henry Fawcett; worked for rights of women; created a Dame of the Order of the British Empire 1925 ('Political Economy for Beginners'; 'Women's Suffrage'; 'Life of Queen Victoria').
- Fawkes (*fāks*), Guy (1570-1606), leader in Gunpowder Plot F-20
- Fawn, name given to deer, buck or doe, under one year old.
- Fayal (*fī-āl'*), one of the Azores Islands; 65 sq. mi.; pop. 19,000; chief town, Horta: A-408
- Fayette (*fā-ēt'*), Mo., agricultural trade center 100 mi. e. of Kansas City; pop. 2608; Central College.
- Fayette, N. Y., town 7½ mi. s. of Waterloo, near Cayuga Lake
- Mormon church organized M-258
- Fayetteville, Ark., city in Ozark Mts.; pop. 8212; summer resort; fruit, live stock, grain, dairy products, hardwood lumber; University of Arkansas: A-296, *map* A-296
- Fayetteville, N. C., city on Cape Fear River 54 mi. s. of Raleigh in agricultural district; pop. 17,428; textiles, lumber and lumber products, turpentine; Fort Bragg near by; state normal school (Negro): *map* N-156
- Fayolle (*fā-yōl'*), Marie-Emile (1852-1928), French general, marshal of France; on retired list at beginning of first World War; division and corps commander 1914-15; commanded French forces in Somme offensive July-November 1916; commanded central group of armies 1917, northern group 1918.
- Fayum (*fī-qm'*), or Fayoum, Egypt. *See* in *Index* Faiyum, El
- Fazenda, a coffee plantation B-226a, C-296
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- finger-prints F-43, U-223
- FCA (Farm Credit Administration) R-146g, F-12
- FCC (Federal Communications Commission) R-146g, R-26, 31-31a
- FCIC (Federal Crop Insurance Corporation) R-146g, U-230
- FDIC (Federal Deposit Insurance Corporation) B-43, U-223
- Fealty, oath of, in feudalism F-28
- Fear, Cape, on s. coast of North Carolina, *map* N-156
- Fear, physical effect of E-262
- Feast, religious H-319, 323. *See also* in *Index* Holidays and festivals

ü=French u, German ü; ĵem, ĵo; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); κ=German guttural ch

- Feast of Dedication, or Feast of Light.** *See in Index* Hanuka
- Feast of Fools.** *See in Index* Fools, Feast of
- Feast of Lanterns, in China** H-322
- Feast of Tabernacles.** *See in Index* Tabernacles, Feast of
- Feast of the Ass, religious festival in medieval France** A-338
- Feast of Weeks, or Pentecost, a Jewish festival occurring 50 days (seven weeks) after the Passover; originally a harvest feast, later a festival commemorating the giving of the law to Moses on Mt. Sinai.**
- Feathers** F-20-1
coloration B-131-2, F-21; changing color B-129-30; protective P-354, pictures P-355, B-131
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- Feather-wing beetle** B-82
- Feberite, a tungsten ore** T-150
- Feb'ruary** F-21
birthdays of famous persons. *See in Index* Anniversaries and birthdays, table
birthday stone G-25
holidays H-320
- February Revolution, revolution of 1848 in France** L-203
- Fechner (fěk'nēr), Gustav Theodor (1801-87), German philosopher and physicist, founder of modern experimental psychology.**
- Federal Board for Vocational Education** V-315
- Federal Bureau of Investigation (FBI)** U-223
finger-prints F-43, U-223
- Federal Bureau of Narcotics** N-12
- Federal Capital Territory, Australia, or Australian Capital Territory, district in s. e. part of New South Wales; 940 sq. mi.; pop. 9000; contains Canberra, cap. of Commonwealth of Australia:** C-70, map A-372a
- Federal Communications Commission (FCC)** R-146g, R-26, 31-31a
- Federal Council of Churches of Christ in America, an organization composed of representatives of the various Protestant denominations; organized 1905; first meeting in Philadelphia 1908; purpose is to bring about unity of churches the better to promote Christian principles.**
- Federal courts (U. S.)** C-385
- Federal Crop Insurance Corporation (FCIC)** R-146g, U-230, A-57
- Federal Deposit Insurance Corporation (FDIC)** B-43, U-223
- Federal district, an area set apart from the states or provinces of a federated nation, usually to serve as the seat of the national government**
District of Columbia W-27-8
- Federal Emergency Administration of Public Works, better known as Public Works Administration (PWA)** R-146g, e
- Federal Emergency Relief Administration (FERA)** R-146g, e
- Federal Farm Board** F-12, H-336
- Federal Farm Loan banks** F-12
- Federal Farm Mortgage Corporation** F-12
- Federal government, definition** P-294
- Federal Hall, first United States capitol; built 1699 on site of present sub-treasury building, New York City; on balcony, George Washington was inaugurated as first president of the United States:** picture U-236
National Memorial N-18
- Federal Home Loan Bank Board (FHLBB)** U-232, R-146f
- Federal Housing Administration (FHA)** R-146g, U-232
- 'Federalist, The', essays in support of U. S. Constitution** H-205, U-209
- Federalists, U. S. political party** P-291
- Adams, John, elected A-13-14**
- Alien and Sedition Acts** A-127, U-236
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- Hamilton a leader** H-205
- oppose Louisiana Purchase** L-209
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- Federal Land Banks** F-12
- Federal Loan Agency (FLA)** R-146g, U-231
- Federal Motor Carrier Act of 1935** A-388
- Federal Oil Conservation Board** P-152
- Federal plan, of municipal government** M-302
- Federal Plant Quarantine Act** I-90
- Federal Power Commission** U-231
- Federal Radio Commission** R-31
- Federal Reserve Board** F-21, 22
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- commercial paper defined** C-393
- Federal Road Act** R-114
- Federal Savings and Loan Insurance Corporation** B-262
- Federal Security Agency (FSA)** R-146g, U-231, H-257
- Federal Surplus Commodities Corporation (FSCC)** R-146g, A-57
- Federal Trade Commission** F-22, U-231
- "Federal Union," organization formed 1939 to carry out plan for world federation of democratic states as proposed by Clarence K. Streit in his book, 'Union Now', published 1939; chapters in U.S. and Great Britain.**
- Federal Water Power Act** W-51
- Federal Works Agency (FWA)** R-146g, U-232
- Federated Malay States. *See in Index* Malay States**
- Fédération Interalliée des Anciens Combattants (fā-dā-rās-yōn' ān-tēr-āl-yā' dā zāns-yān' kōn-bā-tān'), or FIDAC, a patriotic society** P-89
- Federation of Labor, American (A. F. of L.)** L-44a-b, L-45
- Gompers' work** G-119
- Fedin (fā'din), Constantine Aleksandrovich (born 1892), Russian novelist ('Cities and Years').**
- Feeble-minded** M-117-18
- intelligence tests measure** I-97
- Feed-back circuit, in radio** R-22
- Feeding stuffs. *See in Index* Forage crops**
- Feelers of animals. *See in Index* Antennae**
- Feelings, emotions** P-362, 360
- Feet. *See in Index* Foot**
- Fehling (fä'ling), Hermann von (1812-85), German chemist, born Lübeck, professor of chemistry at Polytechnic Institute, Stuttgart; did important work in industrial and analytical chemistry; introduced Fehling's solution, used in testing for sugar and diabetes.**
- Fehling's solution, a mixture of copper sulphate, sodium hydroxide, and sodium-potassium; blue color changed by simple sugars (monosaccharides), by maltose and lactose, owing to formation of insoluble cuprous oxide, but not by cane sugar (sucrose).**
- Fehmarn (fä'märn), or Femern, German island in Baltic Sea, in province of Schleswig-Holstein; 72 sq. mi.; pop. 10,000; agriculture, stock raising, fishing.**
- Fehrbellin (fär-bē-lēn'), Germany, small town in Prussia 35 mi. n.w. of Berlin; defeat of Swedes under Wrangel by Frederick William the Great Elector 1675.**
- Feint (fänt), a feigned or pretended attack, generally to mislead opponent; used in boxing, fencing, war.**
- Faisal (fä'säl). *See in Index* Faisal**
- Feis-Cecil (fäsh'kyöl), an annual music festival held in Dublin to foster native Irish talent.**
- Feldberg (fēlt'bērk), highest point of Black Forest** B-153
- Feldspar, or felspar, a silicate rock** F-22, M-184, R-121
- labradorite a gem variety** G-28
- moonstone a gem variety** G-28
- relative hardness** M-181
- uses** F-22, P-330
- Felicia (fē-lis'i-ā), a genus of low-growing perennial plants of the composite family, native to Africa; sometimes called Agathe. Flowers sky-blue, aster-like; one species (F. amelloides) called blue daisy, blue marguerite.**
- Felidae (fē'lī-dē), the cat family** C-96
- Felis, the cat genus; includes domestic cats, jaguars, leopards, lions, pumas, tigers, etc.**
- Felix, Antonius, Roman procurator of Judea (52-60 A.D.), before whom the apostle Paul, arrested in Jerusalem, was sent to be judged.**
- 'Felix Holt', novel by George Eliot** E-254
- Felix of Valois, Saint (1127-1212), French monk; co-founder of Trinitarian or Redemptionist Order for liberation of Christian captives from the Saracens; festival November 20.**
- Fellahin (fēl-ā-ēn'), peasants in Arabic-speaking countries** E-198-9, 194, A-39
- Felling a seam, diagram** S-91
- Fellow, in university** U-259
- Fellowships, in universities** U-259-60
- Felly, or fellow, of wheel** W-84b
- Felony, in law, a major crime, such as murder, larceny, or robbery, punishable by death or by imprisonment in a state or federal penitentiary, and by automatic loss of citizenship.**
- Felspar. *See in Index* Feldspar**
- Felt, a fabric** F-23
- hats, making** H-235, pictures H-237, P-113
- Danbury, Conn., a leading center** C-336
- source of materials** C-275
- process of felting** T-69; Mongolia, picture M-222b

Felton, Rebecca Latimer (1835-1930), American woman suffrage leader, born near Decatur, Ga. appointed to U. S. Senate W-133

Felucca (*fē-lūk'ā*), a Mediterranean vessel, usually undecked, with one or more lateen sails: *picture* A-115

Femern Island. *See in Index* Fehmarn
Feminism W-131-3. *See also in Index* Women's rights

Femur (*fē-mūr*), the long bone of the upper part of the leg S-156

Fencing, a sport F-23-4
books about H-313c
foil, *picture* S-358

Fénelon (*fān-lōn'*), François de Salignac de la Mothe (1651-1715), French churchman and author, archbishop of Cambrai and tutor to Louis XIV's eldest grandson, the duke of Burgundy; wrote 'Télémaque', famous didactic tale, children's classic.

Fengtienfu (*fēng-tē-yēn-fq'*), also Mukden, Manchukuo, chief city and former capital, on Hun River. *See in Index* Mukden

Feng Yu-hsiang (*fūng yūk-chāng'*) (born 1880), Chinese war lord, called "the Christian general," amassed large and well-disciplined army; supposedly converted to Christianity but acquired reputation for treachery; joined Nationalist leaders in 1927 but broke with them in 1929.

Fenian cycle, in Irish literature I-132

Fenians (*fē-nī-ānz*), Irish revolutionary society which flourished about 1861-72; sought to end English rule in Ireland; active in the United States and made unsuccessful raids into Canada, 1866-70; failure in direct results, but instrumental in convincing Gladstone and others of the need for reforms; name derived from Fianna, legendary band of heroes surrounding Finn MacCool
support Parnell P-81
Vermont headquarters V-288

Fennec, name of several species of small, foxlike animals characterized by large pointed ears; they live in desert burrows, hunt food at night; true fennec is found in n. Africa and is pale yellowish red.

Fennel, an aromatic herb (*Foeniculum vulgare*) of the parsley family with large umbels of small yellow flowers; leaves finely divided into many threadlike parts; seeds used for seasoning, dried leaves for flavoring sauces.

Fennel-flower. *See in Index* Nigella

Fen'rir, or Fenris the Wolf, in Scandinavian mythology, monster, child of the evil god Loki; kept chained by magic till Ragnarök (Judgment Day), when he is destined to break loose, spread his jaws to heaven and earth, and, breathing fire, devour Odin.

Fens, The, marshy low-lying districts in e. England, in Lincoln, Huntingdon, Cambridge, and Norfolk counties; mostly reclaimed, very fertile.

FERA (Federal Emergency Relief Administration) R-146g, e

Ferber, Edna (born 1887), American novelist and short story writer, born Kalamazoo, Mich.; newspaper reporter at 17; first became known through stories depicting American women in business; won Pulitzer prize 1925; shows alertness of observation ('Dawn O'Hara'; 'Emma McChesney & Co.'; 'So Big'; 'Show Boat'; 'Cimarron'; 'Come and Get It'; 'A Peculiar Treasure', autobiography): A-181

Ferberite, a tungsten ore T-150

Fer-de-lance (*fēr-dū-lāns'*), a large, poisonous snake, *Bothrops atrox*; native to s. Mexico and tropical Central and South America; name means head of a lance and describes its pointed snout; length from 5 to 6 feet

Martinique M-72

Fer'dinand I (1793-1875), emperor of Austria; succeeded 1835; intermittently insane; informal regency headed by Metternich, governing in his name, provoked rebellion which led to his abdication (1848), in favor of his nephew Francis Joseph.

Ferdinand I (1503-64), Holy Roman emperor; succeeded his brother Charles V (1556); responsible for Peace of Augsburg; endeavored to establish religious harmony among Catholics and Protestants enlarges possessions E-323

Ferdinand II (1578-1637), Holy Roman emperor, grandson of Ferdinand I; succeeded 1619
Thirty Years' War T-80

Ferdinand III (1608-57), Holy Roman emperor, son of Ferdinand II whom he succeeded 1637; active in terminating Thirty Years' War; distinguished for scholarship.

Ferdinand II (1452-1516), king of Aragon, "the Catholic" (Ferdinand V of Castile and Leon); first king of united Spain and patron of Columbus: S-230

expels Moors: from Spain M-255; from Tripoli L-121b, *picture* S-227
Inquisition I-80
Isabella of Castile and Leon, his wife I-152
relations with Columbus I-152, C-318, *picture* C-318

Ferdinand I (born 1861), king of Bulgaria (1887-1918), "the old fox of the Balkans," prince of Saxe-Coburg when elected prince of Bulgaria in 1886; assumed title of king or czar 1908; fostered Balkan War 1912-13; entered World War on side of Central Powers 1915; abdicated in favor of son Boris 1918.

Ferdinand I (died 1065), "the Great," first king of Castile and Leon, celebrated for victories over Mohammedans.

Ferdinand V, king of Castile and Leon. *See in Index* Ferdinand II of Aragon

Ferdinand I (1423-94), king of Naples; able but tyrannical, cruel, and treacherous.

Ferdinand I (1865-1927), king of Rumania; succeeded his uncle Charles I (1914).

Ferdinand, kings of Spain. For list, *see in Index* Spain

Ferdinand VII (1784-1833), king of Spain; succeeded on abdication of father, Charles IV, in 1808; deposed by Napoleon same year; restored in 1814; vicious, cruel, incompetent ruler under whom Spain lost American colonies on mainland: S-231

Ferdinand I (1751-1825), king of the Two Sicilies (Ferdinand IV of Naples); succeeded 1759; son of Charles III of Spain; stupid, cruel, cowardly; twice dethroned as king of Naples; restored by the Congress of Vienna.

Ferdinand II (1810-59), king of the Two Sicilies; succeeded in 1830; cruel, treacherous tyrant; earned nickname "King Bomba" by bombarding rebellious cities.

Fère-en-Tardenois (*fēr-ān-tārd-nwū'*), France, military cemetery U-225

Ferghana (*fēr-fū'nā*), fertile valley in Asiatic Russia, now part of Uzbekistan Soviet Socialist Republic; raises cotton, grains, and fruits by irrigation; often invaded through Khojent Pass.

Fergus Falls, Minn., city in w. cent. section, 170 mi. from Minneapolis; pop. 10,848; settled in 1857, incorporated in 1872; state hospital; cooperative creameries and livestock shipping associations: *map* M-192

Fer'guson, George Howard (born 1870), Canadian political leader, born Kemptville, Ontario, Canada; minister of lands, forests, and mines, Ontario, 1914-19; premier and minister of education, Ontario, 1923-31.

Ferguson, Miriam A. (born 1875), governor of Texas 1925-27, 1933-35; second woman to be governor of an American state; she claimed her election was vindication of her husband, James E., governor in 1917, who was impeached and removed from office.

Ferguson, Patrick (1744-80), British soldier; invented first breech-loading rifle used in British army; served with British at Brandywine; killed defending King's Mountain.

Ferguson, Sir Samuel (1810-86), Irish poet and antiquary; president of Irish Academy 1882; his poetry deals with Gaelic myths and traditions ('Lays of the Western Gael').

Fermanagh (*fēr-mān'ā*), a county of Ulster, Northern Ireland; 714 sq. mi.; pop. 55,000; county town, Enniskillen; scene of much fighting 1921-22.

Fermenta'tion F-24
alcohol A-112, Y-204
bacteria produce B-12
bread Y-204, B-229, 230
milk M-173, F-24
Pasteur discovers nature of P-86
tea T-26
tobacco T-104
vinegar V-300
yeasts cause Y-204, 205, P-239

Fermented liquors A-112

Fermi, Enrico (born 1901), Italian physicist; Nobel prize (1938) for research in structure of atom; taught physics at Rome, and in the United States at University of Michigan and at Stanford and Columbia universities: A-362

Fermoy' (*fēr-moi'*), Ireland, garrison town 18 mi. n.e. of Cork; pop. 4500; market for agricultural produce and flour; Sept. 7, 1919, scene of first British reprisals.

Fernandez (*fēr-nān'dāth*), Juan (1536?-1602?), Spanish explorer and navigator; Juan Fernandez Islands, which he discovered, were named for him.

Fernando de Noronha (*fēr-nān'thu thē nō-rō'nā*), rugged island about 125 mi. off coast of Brazil to which it belongs; penal settlement; pop. about 2000; defense base; landing point for airplanes: *map* N-51

Fernando Po (*fēr-nān'dō pō*), Spanish island in the Bight of Biafra off w. coast of Africa; 780 sq. mi.; pop. 25,000; mountainous; timber, sugar, coffee, tobacco, cacao, cotton, indigo: *map* A-42a

Ferndale, Mich., residential and industrial city adjoining Detroit on the north; pop. 22,523; steel tubing, forgings and castings, paint and varnish for automobiles.

Ferney (*fēr-nē'*), Voltaire's estate V-335

- Fernie**, British Columbia, town in s.e. corner; pop. 2732; coal mining, lumbering; police headquarters for East Kootenay; map C-50b
- Ferns** F-24-6, P-236
books about B-207, H-313h
classification B-205
coal formation, picture A-208
reproduction F-24, 26: sori S-75, pictures F-26; spores F-26, S-75
tree-ferns F-24, T-137: New Zealand N-135
uses F-26
- Ferozepore** (*fēr-rōz'pur*), town in Punjab, British India; pop. 65,000; scene of operations of first Sikh War, 1845; now grain-trading city; one of largest arsenals in India.
- Ferrara** (*fēr-rā'rā*), commercial city of n. Italy; pop. 120,000; in Po valley 30 mi. n.e. of Bologna; medieval seat of famous house of Este; 11th-century cathedral and massive campanile; 14th- to 15th-century school of painting; map I-156
- Ferrara**, a basket-hilted sword, picture S-358
- Ferrari** (*fēr-rā'rē*), Gaudenzio (1484-1546), Italian painter, one of masters of Milan School; work uneven, but excels in heads and draperies; colors bright, harmonious; his paintings usually intensely dramatic ('Holy Family with Saints'; 'Life of Christ'; fresco of 'The Crucifixion').
- Ferreira** (*fā-rā'ē-rā*), Antonio (1528-69), Portuguese poet, born Lisbon; called "Portuguese Horace"; works include many poems ('Ines de Castro', a tragedy; 'Cioso', a comedy).
- Ferrelo** (*fā-rā'lō*), or Ferrer, Bartolome, Spanish explorer; explored coast of California 1542-43; perhaps first white man to see coast of Oregon.
- Ferrero** (*fēr-rā'rō*), Guglielmo (1872-1942), Italian historian, disciple and son-in-law of Lombroso; brilliant rather than scholarly ('Greatness and Decline of Rome'; 'Ancient Rome and Modern America'; 'Four Years of Fascism'; 'The Seven Vices', a novel; 'Peace and War').
- Ferret**, a domesticated breed of European polecat F-26
- Ferric and ferrous compounds**, of iron C-175. *See also in Index* Iron
- Ferric chloride**
hydrolysis A-10
reduction to ferrous chloride C-171
- Ferric hydrate**
antidote for arsenic B-272, P-275
- Ferric oxide**, red oxide of iron (Fe_2O_3); chief ingredient of iron rust; hematite is mineral form
valence in C-171
- Ferriocyanic acid**, compound of hydrogen, iron, and cyanogen ($\text{H}_3\text{Fe}(\text{CN})_6$); salts used in blueprints and dyeing.
- Ferris**, Jean Léon Gérôme (1863-1930), American historical painter born Philadelphia; series of about 70 paintings covering period in American history 1492-1865, in Smithsonian Institution, Washington, D.C.
- Ferris wheel**, an amusement device consisting of large wheel with suspended cars holding passengers; invented by G. W. G. Ferris, Pittsburgh engineer, and introduced to World's Fair, Chicago, 1893; original wheel 250 ft. in diameter.
- Ferrocyanic acid**, compound of hydrogen, iron, and cyanogen ($\text{H}_3\text{Fe}(\text{CN})_6$), used in dyeing.
- Ferrol** (*fā-rōl'*), or El Ferrol, seaport and naval station of n.w. Spain; pop. 30,000; shipping, ship-building, fishing; map S-226
- Ferro-manganese**, an alloy of iron and manganese M-53
- Ferrous alloys** A-130
- Ferrous and ferric compounds**, of iron C-175. *See also in Index* Iron
- Ferrous chloride**, oxidation to ferric chloride C-171
- Ferrous sulphate**, green vitriol or cop-peras S-324
- Ferrum**, Latin and chemical term for iron. *See in Index* Iron
- Ferry** (*fēr-rē*), Jules (1832-93), French statesman, opponent of the empire, premier 1880-81, 1883-85; promoted free, compulsory, non-clerical education; bitter against Jesuits; president of Senate in 1893.
- Ferry**, means of conveyance across river or other narrow body of water
boat S-128, picture N-129
cable ferry in South Africa, picture S-201
railroad R-41, pictures G-146b, R-44
- Fertile Crescent**, semicircle of fertile land fringing the Arabian Desert S-361, map E-204
- Fertilization**, in biology B-112, H-283-4, pictures H-285. *See also in Index* Pollen and pollination; Reproduction
- ferns** F-26
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- Fertilizers** F-27. *See also in Index* Guano
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oil cake F-19
phosphorus types F-27: phosphate rock used P-177, F-112
potassium types: potash F-27; sources P-323-4
sewage S-87
soy bean cake M-51
- Fess**, Simeon D. (1861-1936), American educator, politician, and author, born Allen County, Ohio; president Antioch College 1907-17; congressman 1913-23; U. S. senator 1923-35; chairman of Republican National Committee 1930-31 ('Outline of U. S. History'; 'American Political Theory'; 'Problems of Neutrality'; 'Movement Toward an International Court').
- Fessenden**, Reginald Aubrey (1866-1932), physicist and engineer, born in province of Quebec, Canada; chief chemist Edison laboratory 1887-90; professor of electrical engineering, Purdue University and University of Pittsburgh; researches in radio and submarine signal work; his inventions include fathometer and special radio antennae.
- Fessenden**, William Pitt (1806-69), American statesman and financier, born Boscawen, N. H.; noted anti-slavery leader; secretary of treasury 1864-65; reestablished financial stability by issuing the famous "7-30" bonds (bearing interest at 7.3 per cent) in denominations as low as \$50; U. S. senator 1854-64, 1865 to his death.
- Festivals** H-319-23. *See also in Index* Holidays and festivals
- Fes'tus**, Porcius, Roman procurator of Judea about 60 to 62 A.D. before whom the apostle Paul was brought for his final trial after being left a prisoner by Felix, Festus' predecessor.
- Feterita** (*fēt-ē-rē'tā*), a grain sorghum introduced into U.S. from Sudan region of North Africa in 1906; grown in the Southwest.
- Fetish** (*fēt'ish*), or fetich, object worshipped as dwelling place or representation of a spirit M-32
Sudan Negroes A-39
- Fetlock**, upper joint of the toe of horse H-341
- Feuchtwanger** (*foikt'väng-ēr*), Lion (born 1884), German writer of novels and plays, born in Munich of Jewish family; came to United States 1940; wrote novels of great dramatic force and rich historic background; exiled from Germany 1933 ('The Ugly Duchess'; 'Power'; 'Success'; 'The Oppermanns'; 'The Jew of Rome').
- Feudalism** F-27-30
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Latin America, modern L-67g
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serfs S-160-1
shelter S-112-13, C-92-5
- Feuds**, or vendettas, violent quarrels, often hereditary, between clans or families
Albania A-107
Corsica C-372
Kentucky K-13
- Feuillants** (*fū-yān'*), a political club organized in Paris during French Revolution; rival of Jacobins; opposed everything not in constitution of 1791; named for religious order that had occupied monastery in which club met.
- Fever**, a condition in which the body temperature rises above normal. *See also in Index* specific name of fever, as typhoid fever, yellow fever, etc.
measured by thermometer T-78
- Feverfew**, a popular garden flower (*Chrysanthemum Parthenium*) of the composite family with tall branching stem, yellowish-green compound leaves, and flowers, with white or cream rays and yellow centers, in large clusters.
- Few**, William (1748-1828), American statesman and soldier, born near Baltimore; lieutenant colonel in Revolution; active in political life of Georgia during and after war; among first U. S. senators; moved to New York City (1799).

Fewkes (*fūks*), Jesse Walter (1850-1930), American ethnologist, born Newton, Mass.; authority on archeology of cliff dwellers and Hopi Indians; chief of Bureau of American Ethnology, Smithsonian Institution ('Snake Ceremonials at Walpi'; 'Casa Grande, Arizona'; 'Aborigines of Porto Rico and Neighboring Islands').

Fez, or **Fas**, city of Morocco, 125 mi. s. of Strait of Gibraltar; pop. 144,000; caravan trade center and distributing city for n. Africa; independent from 13th to 16th century; gave name to cap: map A-127 university M-260

Fez, brimless red cap formerly worn by Turks, picture T-160

Turkish law forbids T-161

Fezzan (*fē-zān'*), in Libya, plateau of Sahara Desert, surrounded by hills; 156,000 sq. mi.; pop. about 70,000; chief city, Murzuk: L-121a, map A-42a

FHA (Federal Housing Administration) R-146g

FHLBB (Federal Home Loan Bank Board) U-232, R-146f

Fianna (*fē-ān'ā*), legendary band of ancient Celtic heroes surrounding Finn MacCool. See in Index Fenians; Finn MacCool

Fi'at money, irredeemable paper money made legal tender by edict or statute M-221

assignats F-202

"Greenback" party demands H-252

U.S. 'Continental' R-87

Fiatola (*fē-yū'tō-lā*). See in Index Butter-fish

Fiber furniture F-222

Fiberglas, a spun glass product.

Fiberloid, a synthetic plastic P-246

Fiberlon, a synthetic plastic P-246

Fibers F-30, T-69. See also in Index chief fibers by name

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rope and twine R-153-5

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eucalyptus E-314

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kitool (palm) B-250

papyrus P-62

pineapple P-221

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wood, picture T-131

yucca Y-211

Fibers, of muscle M-304-5

Fibers, of nerve N-65, B-220, 222-3

Fibrin, in blood plasma B-157b, B-109, picture G-79

Fibrolite. See in Index Sillimanite

Fibrous membrane, membrane composed of fibrous tissue, as the peri-

osteum around bones and the sheaths of tendons.

Fibrous roots R-153

Fib'ula, the outer bone of the leg below the knee S-156, picture S-156

Fichte (*fīk'tū*), Johann Gottlieb (1762-1814), German idealistic philosopher who built on the foundation of Kant's teaching; 'Addresses to the German Nation' stimulated patriotic resistance to Napoleon

influence on German literature G-63

urges educational reform E-176

Ficke (*fīk'ē*), Arthur Davison (born 1883), American poet, born in Davenport, Iowa; infused new life into old forms of poetry ('Sonnets of a Portrait Painter'; 'The Man on the Hilltop'; 'Spectra', with Witter Bynner, a burlesque of new poetry; 'Chats on Japanese Prints').

Fiction, literature devoted to imaginary events, characters, and scenes. See in Index Allegory; Drama; Fables; Fairy tales; Novel; Romance; Short story; Stories

Ficus (*fī'kūs*), a genus of trees including figs and the India-rubber tree F-31-2

FIDAC (Fédération Interalliée des Anciens Combattants), a patriotic society P-89

Fiddle, or violin V-301-2. See also in Index Violin

Fiddle-back chair, or **splat-back chair A-171**

Fiddler crab, small crabs occurring in great numbers along the e. coast of the U. S., s. of Cape Cod living in burrows in sand; the male has one very large claw, while the other is small; the waving motion of the large claw has given them their name.

Fidler, Peter (1769-1822), Canadian fur trader and surveyor, born Bolsover, Derbyshire, England; 1788 joined Hudson's Bay Company and spent rest of life in Canadian Northwest.

Fidus Achates. See in Index Achates Pief (*fēf*), in feudal system F-28

Field, Cyrus West (1819-92), American financier, born Stockbridge, Mass.; projector and promoter of the first submarine transatlantic cable: C-8-9

Field, David Dudley (1805-94), American lawyer and law reformer, born in Haddam, Conn.; brother of Cyrus West Field and Stephen Johnson Field; in 1847 was head of commission to revise legal code of state of New York.

Field, Eugene (1850-95), American poet and journalist, noted for child poems F-30-1

Field, John (1782-1837), English composer and pianist, born in Dublin; settled permanently in Moscow after 1820; wrote piano concertos, romances, quartets, sonatas, but chiefly remembered for his nocturnes of which form he was practically the originator. These nocturnes served as models for Chopin and as beginning of modern romantic school.

Field, Marshall (1834-1906), American merchant and philanthropist, born Conway, Mass.; after clerking in store at Pittsfield, Mass., he moved to Chicago 1856 and early became a business leader; endowed Field Museum, Chicago, later Chicago Natural History Museum department store development H-228-9

Field, Marshall, 3d (born 1893), newspaper publisher, born Chicago.

Ill.; inherited millions from grandfather, Marshall Field; his newspaper support F. D. Roosevelt's policies.

Field, Rachel Lyman (Mrs. Arthur S. Pederson) (1894-1942), American author, born New York City; awarded Newbery medal for 'Hitty', story of wooden doll, 1930; also wrote plays ('Cross Stitch Heart and Other Plays'); poems ('Taxis and Toadstools', 'Points East', 'Pointed People'); novels ('Time Out of Mind'; 'All This, and Heaven Too').

'Hitty', picture L-157

Field, Stephen Johnson (1816-99), American jurist, born in Haddam, Conn.; authority on constitutional law; chief justice of California 1859-63; associate justice of U.S. Supreme Court 1863-97; member of Electoral Commission 1876.

Field, land area, origin of word A-48

Field, magnetic action explained E-227-9

Field Army, U. S. A-307c-d

Field artillery, artillery that moves with an army in the field A-307b-c, A-319-22

shrapnel A-321, picture A-320

U.S. Army, insignia, picture U-178

Field cricket, an insect C-397

Fieldier, in baseball B-54, 56b

Field glass, or **binocular T-39**

stereoscopic principle S-286

Field goal, in football F-151

Field gun A-319-21

Field hockey H-314

Fielding, Henry (1707-54), English novelist, called by Byron the "prose Homer of human nature"; "Tom Jones", a "matchless work of art," often coarse, but always vigorous, clear-sighted, and sincere: N-182

Thackeray inspired by T-72

Field magnet, of electric generator and motor E-217, 218

Field mouse, or **meadow mouse M-293**

bird enemies B-122

migrations M-166

Field Museum of Natural History. See Chicago Natural History Museum

Field officer, U. S. Army A-307d

Field of the Cloth of Gold, plain in n. France, near Calais H-278

Field pattern, in radio R-27

Fields, James Thomas (1817-81), American publisher and author, born in Portsmouth, N. H.; editor of *Atlantic Monthly*, 1862-70; friend and adviser of many distinguished writers ('Underbrush'; 'Yesterdays with Authors').

Fields, W. C. (born 1879), actor, born Philadelphia, Pa.; first stage appearance 1898 in New York City; famous for juggling acts; 1915-21 with 'Ziegfeld Follies'; in motion pictures since 1925 ('Poppy'; 'You Can't Cheat an Honest Man').

Field spaniel, a dog D-83

Fiesole (*fē-ā'sō-lā*), Mino da (1431-84), Italian sculptor (real name Mino di Giovanni) S-57

Fiesole, a town in Italy 3 mi. n.e. of Florence; pop. 10,000; home of Fra Angelico; ancient Faesulae, important Etruscan city.

Fiesta, a festival L-67k: Mexico M-137, 138

Fiesta-flower. See in Index Nemophila

Fife, a maritime county in e. Scotland, between Firth of Tay and Firth of Forth on North Sea; 322,844 acres; pop. 293,000.

Fife, musical instrument W-135, picture M-322

- Fifth, in music S-198
 Fifth Avenue, famous street of New York City N-127
 "Fifth column" W-178h
 "Fifty-four forty or fight" P-296
 Figaro (*fē-gū-rō*), the daring witty roguish barber in Beaumarchais's 'Barber of Seville' and 'The Marriage of Figaro'; a brilliant Parisian periodical was named for him.
 'Figaro, Marriage of', opera by Mozart O-231
 Fighting France, name adopted July 14, 1942, for "Free French" movement W-178j
 'Fighting Téméraire' (*tā-mā-rēr*'), painting by Turner F-40-1, picture F-40
 Figig, oasis in Algeria near Moroccan border, map A-127
 Fig-marigold, common name of genus *Mesembryanthemum*; includes the ice-plant of greenhouses; thick leaves contain special water storage tissue: picture P-235
 Figs F-31-2
 drying, picture T-164
 lac bugs live on tree L-52
 tree, color plate A-36b
 Figure eight knot K-35, picture K-36
 Figures of etymology, defined F-33
 Figures of speech F-32-3
 slang S-158
 use in writing W-186-7
 Figures of syntax, defined F-33
 Figuring, optical term for the process of polishing lenses T-40
 Fig-wasp F-31, 32, picture F-32
 Figwort family, or Scrophulariaceae (*skrōf-ū-lā-ri-ā'sē-ē*), a family of plants, shrubs, and trees including snapdragon, foxglove, calceolaria, monkey flower, night phlox, pentstemon, veronica, and nemesia.
 Fiji (*fē-jē*) Islands, group of about 250 islands of Pacific; 7083 sq. mi.; pop. 200,000; British crown colony: F-33, map P-10b-c
 cotton C-382
 sandalwood S-23
 Filament, any threadlike structure; in electricity, a wire used to give heat, light, or to emit electrons
 alloys for electric filaments A-133
 electrical appliances A-132
 electric lamp E-234, T-150, I-116
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 vacuum tubes R-21, E-242, 243, pictures R-22, E-240
 Filaria (*fī-lā-ri-ā*), a worm W-180b
 Filbert, a hazelnut H-253
 Filchner, or Wilhelm, Shelf Ice, Antarctica A-214, map A-215
 Fildes (*fīlds*), Sir Luke (1844-1927), English painter; painted Venetian street scenes and portraits, but best known for 'The Doctor'.
 File, a tool T-111
 Filet (*fē-lā*) lace L-48, picture L-49
 Filibuster, originally, a freebooter; now, one who takes part in a military expedition to a foreign country in time of peace for personal aggrandizement or political annexation; Walker expedition to Nicaragua and Dr. Jameson's Raid in South Africa are famous filibustering expeditions; in legislation, term is applied to one who by dilatory tactics and manipulation of parliamentary procedure attempts to delay or prevent voting on bills.
 Filicales (*fīl-i-kā'lēz*), order of plants made up of the true fern.
 Filiplinos, natives of the Philippine Islands P-166-8, 169
 citizenship status, U.S. C-239
 Filippo Lippi. See in Index Lippi, Fra Filippo
 Fillets, of fish F-82
 Fillmore, Abigail Powers (1798-1853), the first wife of President Fillmore W-91
 Fillmore, Millard (1800-74), 13th president of U.S. F-33-5
 administration (1850-53) F-34
 Compromise of 1850 C-327-8, F-34
 Perry's expedition to Japan J-184
 'Uncle Tom's Cabin' S-304
 wives W-91
 Filly, a young mare H-345
 Film, photographic P-184, C-302, chart C-123
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 micro-film photography N-109
 motion picture M-278, pictures M-279, 286, 287, 288; invention M-290; length M-276; talking pictures M-278, 280
 orthochromatic P-185
 pack P-185
 panchromatic P-185
 safety P-245j
 Filter, a device which allows solutions to drain, be drawn (vacuum type) or forced (pressure type), through specially prepared paper, diatomaceous earth, porcelain, or other absorbent material, to remove solid particles or coloring matter from the solution: C-174, picture C-303
 colors cleared in solution C-303
 gases purified C-303
 press, picture S-321
 sewage purified S-87
 sugar refining S-322, C-144, picture S-321
 vacuum filter, picture S-321
 water supply for cities W-55
 Filtration. See in Index Filter
 Fin, of animals. See in Index Fins
 Fin, of automobile, picture A-387
 Finale (*fē-nā'lā*), the final part or last number of a musical composition M-313
 Finance, the work of obtaining and using money and credit for the support of private and public enterprise. See also in Index Banks and banking; Bonds; Capital; Credit; Money; National debt; Stocks; Taxation
 Commercial Revolution develops methods I-74a
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 Finance company I-93
 Finance Department, U. S. Army A-307b
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 Fin-back whale W-80, picture W-79
 Finch, Francis Miles (1827-1907), American poet and jurist, born Ithaca, N.Y.; best known for lyrics 'Nathan Hale' and 'The Blue and the Gray'.
 Finch family, *Fringillidae*, a large family of seed-eating birds F-35
 Finck, Henry Theophilus (1854-1926), American musical critic, born Bethel, Mo.; on *New York Evening Post* for more than 40 yrs.; adherent of Wagner, Grieg, Tschaikevsky, MacDowell, and other modern composers ('Wagner and His Works'; 'Songs and Song Writers'; 'Success in Music and How It Is Won').
 Findlay, Ohio, a manufacturing city and oil center 43 mi. s. of Toledo; pop. 20,228; petroleum, foundry, rubber, and clay products; Findlay College: map O-210
 Findlay College, at Findlay, Ohio; founded 1882 by Church of God; arts and sciences, commerce.
 Fine arts F-36-42. See also in Index Architecture; Art; Music; Painting; Poetry; Sculpture
 Fine Arts Building, World's Columbian Exposition, Chicago, picture F-5
 Fingal (*fīn-gāl*'), a name by which the legendary Celtic hero Finn MacCool was sometimes known in Scottish legend; popularized by Macpherson's epic 'Fingal'. See also in Index Finn MacCool
 Fingal's Cave, Scotland C-118, picture S-46
 Finger, Charles J. (1871-1941), American author and editor, born Willesden, England, came to U. S. 1887; traveled in South America, Africa, Canada, Antarctic, Mexico; editor *All's Well* 1920-41 ('Highwaymen'; 'Tales Worth Telling'; 'Tales from Silver Lands', awarded Newbery medal 1925; 'Courageous Companions'; 'After the Great Companions'; 'Give a Man a Horse'; 'Fighting for Fur'): S-303j-k
 Finger, of hand H-207-8, pictures H-208, S-156
 Finger Lakes, N. Y., narrow lakes in w. N. Y.; famous scenic region; popular resort section; grape cultivation; principal lakes: Canandaigua, Keuka, Seneca, Cayuga, Owaseco, and Skaneateles
 made by glaciers I-2a
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 Finisterre (*fēn-ēs-tēr*'), Cape ('land's end'), high promontory on n.w. coast of Spain; naval victories of English over French 1747, 1805: map S-226
 Finland, republic of n. Europe; about 135,000 sq. mi.; pop. 3,665,000; cap. Helsinki: F-44, maps E-326e, f, N-173
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 Finland, Gulf of, arm of Baltic Sea between Finland on n. and Esthonia and Russia on s.; length 260 mi.; width 25 to 80 mi.: maps E-326e, N-173
 Finlay, Carlos Juan (1833-1915), Cuban physician; in 1881 advanced theory that the mosquito (genus *Stegomyia*) is carrier of yellow fever germ; chief health officer of Cuba 1902-9: M-268, 270
 Finlay River, Canada, headstream of Peace River; rises in n. cent. British Columbia.
 Finlayson, Roderick (1818-92), Canadian fur trader, born Ross-shire, Scotland; joined Hudson's Bay Company in 1837; commanded Ft. Victoria, B.C., 1844-72.
 Finley, John, American pioneer and Indian trader; discovered Cumberland Gap about 1765: B-192
 Finley, John Huston (1863-1940), American educator, editor, and author, born Grand Ridge, Ill.; president Knox College 1892-99; professor politics, Princeton University, 1900-03; commissioner of

- education, state of New York, and president University of State of New York, 1913-21; associate editor *New York Times*, 1921-37, editor-in-chief 1937-38 ('The French in the Heart of America'; 'A Pilgrim in Palestine'; 'The Debt Eternal') quoted, on leisure L-93
- Finn, Francis James** (1859-1928), American Catholic priest (Jesuit), educator, and author of books for boys, born St. Louis, Mo.; director St. Xavier School, Cincinnati ('Percy Wynn'; 'Tom Playfair'; 'Lucky Bob'; 'Candles' Beams').
- Finnan haddie**, smoked haddock H-194
- Finney, Charles Grandison** (1792-1875), American Congregational minister, born Warren, Conn.; famous revivalist preacher; became president of Oberlin College 1852; grandfather of Kenyon Cox.
- Finnish language and literature** F-44
- Finn MacCool**, or **Fionn MacCumhail**, Celtic (Irish) legendary hero, leader of the Fianna (Fenians), wooer and finally husband of Grania, and father of the bard Ossian (Oisín) I-132, S-303g
- Finno-Tatars**, great division of the human family which includes the Finno-Ugric peoples of Europe and the Mongolo-Tatars of Asia R-10
- Finno-Ugric**, name of a group of peoples and languages of the Finno-Tataric division; includes not only inhabitants of Finland, but similar tribes in Russia, as well as the Ostiaks, Voguls, Magyars, and other related tribes of Ugric stock, named from Yura or Ugra, country on either side of Ural Mts.
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- fish F-67, 68, 70, pictures F-67, 69
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- Finse**, resort in Norway N-172
- Finsen** (*fin'sēn*), **Niels Ryberg** (1860-1904), Danish physician, born in the Faeroes; first to employ ultraviolet sun rays in treating disease; invented Finsen curative lamp; awarded Nobel prize in medicine, 1903.
- Finsteraarhorn** (*fin'stēr-är'hörn*), highest summit of Bernese Alps; 40 mi. s.e. of Bern, Switzerland (14,022 ft.): S-349
- Fiona Macleod**. See in *Index* Sharp, William
- Fionn MacCumhail**. See in *Index* Finn MacCool
- Fjords** (*fi-yōrdz'*), or fjords, long, narrow deep arms of sea running far inland
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- Norway N-171-2, 174, picture N-176
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- regrowth after forest fire E-145c
- spruce distinguished from, picture S-264
- Firdausi** (*fir-dou'sē*), **Firdousi**, or **Firdusi** (940?-1020), Persia's greatest poet; real name Abul Kasim Mansur; author of the 'Shah Na-Mah', or Book of Kings, an epic history of Persia from the legendary kings to the Mohammedan conquest: S-303b, P-134
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- whaling gun W-80, picture W-78
- wood used in gun-stocks W-5, B-286
- World War**, 1st developments W-156
- Fireball**, in warfare, a projectile or a bag containing combustibles used to light up or set fire to defensive works of enemy; called flares in first World War.
- Fire-bird**, or scarlet tanager T-8, color plate B-140
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- Fire brick** B-238, C-180, G-101
- Fire clay** C-261
- glass making G-101
- Fire-control**, on battleship N-53-4
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- Fire-damp**, an explosive gas found in coal mines; its chief constituent is methane or marsh gas.
- Fire department** F-53-8, pictures F-53-6, V-266f
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- Firestone, Harvey Samuel** (1868-1938), American manufacturer of rubber products; born Columbiana County, Ohio; organized Firestone Tire and Rubber Co. in Akron, Ohio, in 1900; led movement for study of rubber-growing possibilities throughout the world: R-165
- Fire-tube boilers** S-281
- Fire walking**, a religious rite of old and obscure origin consisting of walking on a bed of stones that have been heated by a fire underneath; survives in Tahiti, Fiji Islands, and India.
- Fireweed**, or great willow-herb, a tall graceful perennial plant (*Epilobium angustifolium*) having willow-like leaves and tall spikes of purplish-pink flowers; especially abundant where ground has been burned over
- pollen grain, picture F-125
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ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

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First International, the International Workingmen's Association (1864-75), associated with Marx C-325
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Firth of Lorne, inlet of Atlantic, w. coast of Scotland, *map* E-270a
 Caledonian Canal S-44
Fischer (fish'ér), Emil (1852-1919), German chemist; professor of chemistry at Würzburg and Berlin universities; produced simple sugars and other organic substances synthetically; with Abderhalden laid foundation of enzyme chemistry; won Nobel prize 1902.
Fischer, Hans (born 1881), German chemist, professor of organic chemistry at Munich Institute of Technology, 1930, for theory of structure of hemoglobin.
Fish, Hamilton (1808-93), U.S. secretary of state 1869-77; had part in settling *Alabama* claims.
Fish, Stuyvesant (1851-1923), American banker and railroad official, son of Hamilton Fish; president Illinois Central Railroad 1887-1906; held high positions in railroads, banks, and corporations; published 'The Nation and the Railways'.
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Fisher, Dorothy Canfield. *See in Index* Canfield, Dorothy
Fisher, Frederick Bohn (1882-1938), American Methodist Episcopal bishop, born Greencastle, Pa.; missionary in India, 1904-06; secretary Foreign Missions and Laymen's Missionary Movement, 1910-20; bishop of India 1920-30 ('India's Silent Revolution'; 'Which Road Shall We Take?').
Fisher, Harrison (1877-1934), American illustrator, born Brooklyn, N.Y.; won popularity through well-known type of "American girl."
Fisher, Harry C. ("Bud") (born 1884), American comic artist, born in Illinois; created 'Mutt and Jeff'; first to draw a daily comic strip and to syndicate his work widely.
Fisher, Irving (born 1867), American economist, born Saugerties, N. Y.; professor political economy, Yale, after 1898; editor *Yale Review*, 1896-1910; author of a number of works on mathematics and political economy
 money stabilization plan M-222
Fisher, John, Saint (1469?-1535), English bishop, chancellor of Cambridge; friend of Erasmus; opposition to Henry VIII's divorce and refusal to recognize him as head of the church led to execution; canonized 1935.
Fisher, Peter (1782-1848), Canadian Loyalist and historian, born Staten Island, N.Y.; settled at Fredericton and known as first historian of New Brunswick ('Sketches of New Brunswick, Containing an Account of the First Settlement of the Province').
Fisher, Vardis (born 1895), educator and author, born Annis, Idaho; professor of English at University of Utah 1925-28, New York University 1928-31 ('Forgive Us Our Virtues'; 'Children of God'; 'City of Illusion').
Fisher of Kilverstone, John Arbuthnot Fisher, first Baron (1841-1920), British admiral; entered navy 1854; first sea lord of British admiralty 1904-10 and 1914-15; forceful naval reformer; first to introduce use of dreadnoughts.
Fisher, black marten, or pekan M-72
Fisheries F-78-82. *See also in Index* Clam; Crab; Lobster; Oyster; Pearl; Shrimp; Sponge; Whaling; *also* names of various fishes, such as Salmon, Mackerel, Cod, etc. Alaska A-100, 106, F-76: salmon S-13; seal S-69
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 United States Coast Guard protects C-289
Fisheries, Bureau of, former bureau of U. S. government; combined with Bureau of Biological Survey 1940 to form Fish and Wildlife Service. *See in Index* Fish and Wildlife Service
Fisher's Hill, battle of, fought 20 mi. s. of Winchester, Va. (September 1864)
 Sheridan at S-114
Fishes (Latin Pisces), a sign of the zodiac Z-218

Key—cäpe, ät, fär, fäst, whät, fäll; mä, yët, fërn, thäre; ice, büt; rōw, wōn, fōr, nōt, dō; cūre, büt, rȳde, fȳll, bȳrn;

"Fishes, Age of," or Devonian period, in geology G-40, S-102, *picture* G-41

Fishguard, Wales, seaport of Pembrokeshire in n. on Fishguard Bay, excellent harbor; fisheries; "Fishguard Invasion" of French under General Tate, Irish-American adventurer (1797): *map* E-270a

Fish hawk, or osprey H-246-7

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whale W-80, *pictures* W-77, 78

Fish-ladders, Bonneville Dam, *picture* D-8

Fish meal F-82

Fish tapeworm W-180a

Fisk, "Jim" (1834-72), an American financial speculator, born Bennington, Vt.; associated with Daniel Drew and Jay Gould; in Erie raid gained millions and caused wide ruin by attempted corner of gold market ending in "Black Friday" panic of 1869; shot and killed by a former associate.

Fiske, Bradley Allen (1854-1942), American naval officer and inventor, born Lyons, N.Y.; rear admiral, U.S. Navy, 1911-16; invented naval telescope sight, resulting in great improvement in naval gunnery, and other devices for warships.

Fiske, John (1842-1901), American historian and philosopher, born Hartford, Conn.; his clear, charming style popularized the theory of evolution and a philosophic view of American history; 'The Critical Period of American History', 'The Discovery of America', etc. form practically a connected history quoted on Magellan's voyage M-28

Fiske, Minnie Maddern (1865-1932), American actress, born New Orleans; appeared on stage from early childhood; acting had great intellectual and dramatic power; famous for her Ibsen rôles and for parts of Becky Sharp and Mrs. Malaprop.

Fisk Jubilee Singers, a group of Negro singers affiliated with Fisk University; organized 1871 and toured successfully in U.S. and abroad; internationally famous for interpretation of Negro spirituals and folk songs.

Fisk University, Nashville, Tenn., institution for Negroes (founded 1866).

Fission, in biology, reproduction by splitting apart C-122, *picture* C-121

Fission-fungi, or Schizomycetes, class of low plants to which bacteria belong B-205

Fitch, Clyde (1865-1909), American playwright, most popular of his time and also the most prolific; a brilliant but often careless writer; chief plays 'The Climbers', 'The

Truth', 'The Girl with the Green Eyes'.

Fitch, John (1743-98), American inventor F-82

Fitch, name given to the fur of the European and Siberian polecat, a mammal related to the weasels; Siberian variety called perwitsky; used in furriery; hair short, color dark brown and yellow.

Fitchburg, Mass., an industrial city 41 mi. n.w. of Boston; pop. 41,824; paper, textiles, machinery, bicycles, firearms, saws; state teachers college: *map* M-82

Fitton, Mary, maid of honor to Queen Elizabeth; supposed by some to be the "dark lady" of Shakespeare's sonnets.

Fitto'nia, a genus of South American plants, favored for their brilliant foliage

lens-like cell F-121

Fitz, prefix in surnames N-3

Fitz-Boodle, pen name of William Makepeace Thackeray T-72

FitzGerald, Edward (1809-83), English poet, whose famous translation of 'Rubaiyat' of Omar Khayyam is an almost unique instance of successful "transplantation" of a foreign poem.

Fitzgerald, Francis Scott (1896-1940), American novelist, born St. Paul, Minn.; set new fashion in 'This Side of Paradise' depicting revolt of youth ('Flappers and Philosophers'; 'The Great Gatsby'; 'All the Sad Young Men').

Fitzgibbon, James (1780-1863), British soldier, born Ireland; served in Napoleonic Wars, in Canada in War of 1812 and in rebellion of 1837; became adjutant general.

Fitzmaurice, James, Irish aviator non-stop flight Europe to America, *picture* A-73, *table* A-74

Fitzpatrick, Thomas (1799?-1854), American fur trader and trapper, ranked with Carson and Bridger; member of Ashley's expedition up the Missouri 1823; with Bridger and Milton Sublette, formed Rocky Mountain Fur Co., 1830; served as guide to De Smet, Fremont, Kearny, and Abert; ended career as agent to Indians.

Fitzroy River, one of chief rivers of Western Australia, navigable about 100 mi.; flows into Indian Ocean: *map* A-372a

Fitzsimmons, Robert P. (Bob), (1863-1918), Australian boxer, born Helston, Cornwall, England; world's heavyweight champion 1897-99: B-210, *picture* B-211

Fitzsimmons, Thomas (1741-1811), American politician, businessman, born Ireland; aided Revolutionary cause; advocated Hamilton's policies as member of Federal Convention (1787) and congressman from Pennsylvania (1789-95); influential in founding Bank of North America and in obtaining protective tariff.

Fiume (*fë-yo'mä*), Italy, seaport on Adriatic Sea; pop. 50,000; for a time after first World War held by D'Annunzio as independent city-state: F-82, *map* I-156

Five Civilized Tribes, name applied to Cherokee, Chickasaw, Choctaw, Creek, and Seminole tribes living in Oklahoma: O-219, 220

Five-day work week, Soviet Russia R-194

Five-fingers, a plant. *See in Index* Cinquefoil

"Five-foot shelf," known as Harvard Classics, origin E-251

Five Forks, battle of, fought April 1, 1865, 11 mi. s.w. of Petersburg, Va. S-115, *map* C-253

Five Intolerable Acts, against American colonies R-83, 85, 86

Five-lined skink, a smooth-scaled lizard common in e. U.S., *picture* L-172

Five Nations, confederacy of five tribes of Iroquois Indians, formerly living in cent. and w. N.Y. I-53. *See also in Index* Iroquois

Five-power treaty (1922) for reduction of naval armament N-56/, H-219

Five spot. *See in Index* Nemophila

"Five Towns," traditional name for Tunstall, Burslem, Hanley, Stoke-on-Trent, and Longton, since 1925 forming with Fenton the city of Stoke-on-Trent in n. Staffordshire, England; in Arnold Bennett's novels represented by "Turnhill," "Bursley," "Hanbridge," "Knype," and "Longshaw": E-278

Five-Year Plans, Russia R-192-4

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Fixed condenser, in radio R-23, *diagram* R-19

Fixed fats and oils F-19

Fixed nitrogen N-147-8. *See also in Index* Nitrogen, *subhead* fixation

Fixed pulley, *picture* M-105

Fixed stars S-274, *chart* A-343

Fixed trust T-147

Fixture, in law, an article, once a chattel, but later so attached to real property, either physically or by close association in use, that it becomes legally a part of the real property to which it is attached, and is therefore treated as real property by the law.

Fizeau (*fë-zö*'), Armand H. L. (1819-96), French physicist; in 1849 invented a reliable method of determining time that light takes to travel a distance on the earth.

Fjords. *See in Index* Fiords

Flaccus, Quintus Horatius (Horace), (68-8 B.C.), Latin lyric poet L-69, S-160, *picture* R-129

Flack; Marjorie (born 1897), author and illustrator of children's books; born Greenport, L.I., N.Y.; married William Rose Benet 1941 ('Angus and the Ducks'; 'Ask Mr. Bear'; 'The Restless Robin'; 'William and His Kitten').

Flag, an iris I-130

Flag Day (June 14) H-321, F-86

Flagella (*flä-gël'ä*), the hairlike appendages of some bacteria B-13

Flagellants (*fläg'ë-länts*), a fanatic religious sect of medieval Europe; members scourged themselves, believing self-torture cleansed sins; rites still practised by *Penitentes*, sect of Mexicans of New Mexico and s. Colorado.

Flagella'ta, class of unicellular animals with tail or "flagellum."

Flageolet (*fläg'ö-lët*), a musical instrument somewhat similar to the flute; tone more mellow; blown from end instead of side; invented at end of 16th century.

Flaget (*flä-gë'*), Benedict Joseph, French missionary, born Contournat, France; first Roman Catholic bishop of old Northwest Territory, with See at Bardstown, Ky.; ministered to Indians at Fort Vincennes (1792-95); professor at Georgetown University (1795-98), at St. Mary's, Baltimore (1801-10); appointed bishop, 1810.

Flagg, Ernest (born 1857), American

architect, born Brooklyn, N.Y.; designed Singer Building, New York City; Corcoran Gallery of Art, Washington D.C.; and U.S. Naval Academy, Annapolis, Md.; author of 'Small Houses—Their Economic Design and Construction'.

Flagg, James Montgomery (born 1877), American author and illustrator; frequent contributor to *Life* and other magazines; wrote and illustrated 'All in the Same Boat', 'The Adventures of Kitty Cobb', 'The Mystery of the Hated Man'.

'Flag Goes By, The', poem F-84

Flagler, Henry M. (1830-1913), American capitalist

Florida development F-114

Miami founded M-145

Rockefeller and R-122

Flag officer, a naval officer whose rank entitles him to fly a special flag at the masthead of ships under his command; in the U.S. Navy, an admiral, vice admiral, or rear admiral.

Flag of truce, a white banner hoisted during a conflict indicating a desire to communicate with the enemy; the bearers of the flag are respected and protected international law I-109

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war banners F-84

Flags, Feast of, Japan H-322

Flag signals S-143, *picture* S-142

Flagstad (fläg'shtät), Kirsten, Norwegian dramatic soprano; sang Wagnerian operatic roles in Oslo, Bayreuth, New York City, and Chicago; acclaimed for acting ability as well as for the remarkable power and quality of her voice.

Flagstaff, Ariz., town 100 mi. n. of Phoenix; pop. 5080; state teachers college; large tourist trade; the Nahohi (Indian powwow) held annually, in July: *map* A-289

Lowell observatory A-288, P-233

Flail, in threshing T-86

Flak, barrage of antiaircraft fire.

Flame F-46

bunsen, parts of B-273

candle, parts of B-272-3

oxyacetylene A-7

oxyhydrogen H-368

Flame tree, evergreen tree (*Brachychiton acerifolium*) of sterculia family, native to Australia but widely grown in California. Grows 25 ft. to 60 ft.; leaves to 10 in. wide, maple-like, glossy. Flowers scarlet, in large

clusters; fruit black pod, to 4 in. long.

Flamin'go F-103

foot, *picture* F-147

Mountain Lake Sanctuary F-115

scarlet F-103, *color plate* B-134

Flamin'ian Way (*Via Flaminia*), road from ancient Rome to Ariminum (modern Rimini), constructed by censor Flamininus (220 B.C.) R-144

Flamininus (fläm-in'-i-nüs), Titus

Quintius (228?-174 B.C.), Roman

general, victor of Cynoscephalae

(197 B.C.) and 'liberator of the

Greeks.'

Flamininus (flä-mün'-i-nüs), Gaius (died 217 B.C.?), Roman general and

censor; built Circus Flamininus

in Rome and the Flaminian Way;

slain in battle with Hannibal.

Flammation (flä-mä-rē-ōn'), Camille

(1842-1925), French astronomer

and writer of popular scientific

books ('Marvels of the Atmos-

phere').

Flam'steed, John (1646-1719), Eng-

lish astronomer; made many origi-

nal observations; appointed as-

tronomer to King Charles II in

1675; author of '*Historia coelestis*

Britannica', a 3-volume work on his

observations; 3d volume is cata-

log of about 3,000 stars.

Flanagan, Edward Joseph (born 1886),

Roman Catholic priest and founder

of Boys Town, Neb., born Roscom-

mon, Ireland; came to U. S. in 1904,

naturalized in 1919; founded Home

for Homeless Boys in Omaha in

1917, later moved 10 miles w. of

Omaha and established Boys Town.

See also in Index Boys Town

Flanders, district in w. Europe F-103,

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Ghent G-84

Lille L-136

Louvain L-209

Ypres Y-209-10

Flanders, battles of (Ypres and Pass-

chendaele Ridge), first World War

W-161

Canadians at second battle C-415

Ypres destroyed Y-210

Flanders, battle of, in second World

War W-178*-i*

Flanders Field American Cemetery

U-226

'**Flanders Fields**, In', poem by John

McCrae, quoted C-66, P-304

Flandin (flän-dän'), Pierre-Etienne

(born 1889), statesman, born Vichy,

France; favored appeasement

policy; prime minister 1934-35;

foreign minister 1936 and, in the

Vichy government, December 1940-

February 1941.

Flannel, a loosely woven woolen fab-

ric with soft surface, with or with-

out nap.

Flannel-bush, evergreen shrub or

small tree (*Fremontia californica*)

of sterculia family, native to Cal-

ifornia. Leaves have 3 to 5 lobes;

flowers large, yellow, with 5 petals.

Flare, or fireball. *See in Index* Fireball

Flash boiler, for early steam cars

A-388

Flashed decoration, of pottery P-330

Flashlight, small electric hand lamp

with self-contained battery

consumption of lamps for E-235

Flashlight photography P-186

Flat, in musical notation M-318

Flatboat T-122, P-221e, *picture* P-221f

Flatbush, now part of Brooklyn,

N. Y.; "Flatbush Pass," strategic

point in American Revolution.

Flatfish F-103-5

flounder F-117, F-104, *picture* F-105

halibut H-200, F-74, F-104

turbot F-75

Flat-foot F-148

Flathead Indians. *See in Index* Salish

Flathead Lake, Mont., 40 mi. s. of

Glacier National Park; 188 sq. mi.:

map M-243

Flathead River, Mont., issues from s.

end of Flathead Lake and enters

Clark Fork after course of 75 mi.;

fruit-growing region.

Flattery, Cape, Wash., extreme west-

ern point of United States proper;

on American side of entrance to

Strait of Juan de Fuca.

Flat work, laundry service L-71

Flatworms W-180a, Z-227

Flaubert (flä-bér'), Gustave (1821-

80), French novelist and literary

artist; leader of French realists;

his perfect and polished style was

the result of tireless labor ('Ma-

dame Bovary'; 'La Tentation de

Saint Antoine'; 'Salammbô';

'L'Education sentimentale'); F-197,

picture F-196

Flavone (flä-vön) L-90

Flavor, fused sensation of taste,

smell, and touch T-16. *See also in*

Index Essential oils; Spices and

condiments

Flax, plant cultivated for fiber, from

which linen is made, and for its

seed, called flaxseed or linseed

F-105-6, *pictures* F-105, 106

cellulose, from, *chart* C-123

cigarette paper from P-245c

cultivated in ancient Egypt E-202

fiber F-105, T-69

linen L-148, C-274

producing regions F-106: Argentina

A-280b; Belgium B-86; Ireland

I-129, *pictures* F-105

seed-pod, *picture* N-163

Flax family, or Linaceae (lī-nä'sē-ē),

a family of plants, including the

flax and reinwardtias.

Flaxman, John (1755-1826), English

sculptor and designer, works often

charming but obsessed by classi-

cism: S-60

designs Wedgwood ware P-332

Flaxseed. *See in Index* Flax

Flea F-106

South American "chigoe," *picture*

P-68

Fleabane, common name for plants

of genus *Erigeron*, having a pe-

culiar aromatic odor, said to keep

away fleas; native to U.S.; *E. cana-*

densis and *E. philadelphicus* are

valued medicinally for their oil,

which is a strong irritant.

Flebbe, Mrs. George H. *See in Index*

Dix, Beulah Marie

Flecker, James Elroy (1884-1915),

English poet; in British consular

service at Constantinople, Smyrna,

and Beirut; wrote "with single in-

teention of creating beauty"; died

of tuberculosis ('Golden Journey to

Samarkand'; 'The King of Alsand-'

der'; 'Hassan').

Fleet, a stream in London, flowing

into Thames, now converted into

large sewer; gives name to Fleet

Street and Fleet Prison.

Fleet, United States N-53. *See also in*

Index United States Navy

operating range N-52, *maps* N-51, 52

Fleet Street, London, *picture* L-187

Fleetwood, or Fleetwood-on-Wyre,

England, town in Lancashire;

about 15 mi. s.w. of Lancaster;

- favorite seaside resort; pop. 19,000; map E-270a
- Fleming, Alexander** (born 1881), English physician, discoverer of penicillin; professor of bacteriology, University of London; bacteriologist, St. Mary's Hospital.
- Fleming, Sir John Ambrose** (born 1849), English physicist and electrical engineer; active in development of telephone, electric lighting
- Fleming valve** R-27, *picture* R-22
- Fleming, Sir Sandford** (1827-1915), Canadian engineer and publicist; built Intercolonial Railway, in charge of survey of main line of Canadian Pacific; proposed standard time system now used in U. S. and Canada.
- Flemings**, Flemish-speaking people of Belgium B-90
- Flemish art**
brass work C-361
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painting P-16, 18; masters, list P-30; Rubens R-170; Van Dyck V-272
sculpture S-58
tapestry T-10
wood-carving W-138
- Flemish bond**, pattern used in brick-laying, *picture* B-238
- Flemish language** F-103, B-90
- Flensburg** (*flēns'bʏrk*), seaport and manufacturing city of Germany in Prussian province of Schleswig-Holstein; pop. 63,000; map D-53
- Flesch** (*flēsh*), Karl (born 1873), Hungarian violinist, noted as teacher and virtuoso; taught in Europe and at Curtis Institute, Philadelphia ('Art of Violin Playing').
- Flesh-eating animals** (*carnivora*) M-44, *Outline* Z-229
- Flesh-eating plants**. See in *Index* Carnivorous plants
- Flesh fly**, or blow-fly, any one of several large, noisy blue or green flies which deposit their eggs or larvae in meat or other animal matter; bluebottle fly is a familiar type egg, *picture* E-193
- Fletcher, Giles** (1588?-1623), English poet ('Christ's Victorie and Triumph').
- Fletcher, Henry Prather** (born 1873), diplomat, born Greencastle, Pa.; served with "Rough Riders" in Spanish-American War; in diplomatic service in Cuba, China, Portugal, Chile, and Mexico; undersecretary of state, 1921-22; ambassador to Belgium, 1922-24; ambassador to Italy, 1924-29.
- Fletcher, Horace** (1849-1919), American food expert, born Lawrence, Mass.; emphasized importance of prolonged mastication of food, giving rise to the verb "fletcherize."
- Fletcher, John** (1579-1625), English dramatist, collaborator with Francis Beaumont ('Phylaster'; 'The Maid's Tragedy'); D-94
collaborates with Shakespeare S-100f
- Fletcher, John Gould** (born 1886), American poet of "modernist" tendencies, born Little Rock, Ark.; wrote 'Irradiations—Sand and Spray'; 'Goblins and Pagodas'; 'Japanese Prints'; 'Selected Poems' awarded Pulitzer prize 1939.
- Fletcher, Phineas** (1582-1650), English poet, brother of Giles Fletcher ('The Purple Island').
- Fletcher School of Law and Diplomacy**, at Medford, Mass.; founded 1933; graduate school; administered by Tufts College; academic program controlled, principally, by officials of Harvard University.
- Fletcher vs. Peck** U-212
- Flettner, Anton** (born 1885), German engineer; inventor of the rotorship, which is propelled by wind blowing against revolving cylinders, said to be more efficient than sails.
- Fleur-de-lis** (*flūr-dē-lē*), an iris I-130, *color plate* I-130a-b
- French emblem** F-84, I-130
structure of tuber B-269
- Fleurus** (*flū-rūs*), a small town in Belgium, 28 mi. s.e. of Brussels; scene of 4 important battles in Spanish and French wars.
- Flexible glass** G-104
- Flexibility**, in physics, a property possessed by most materials, to a certain degree, which allows them to bend without breaking.
- Flex'ner, Abraham** (born 1866), educator and author, brother of Simon, born Louisville, Ky.; advanced views on education; director division of studies and medical education General Education Board 1925-28; director Institute for Advanced Study, Princeton, 1930-39.
- Flexner, Simon** (born 1863), American pathologist and bacteriologist, born Louisville, Ky.; director of laboratories, Rockefeller Institute for Medical Research 1903-35; discovered serum for treatment of cerebrospinal meningitis.
- Flicker**, a woodpecker W-134, *pictures* W-134, *color plate* B-136
courtship, *picture* B-126
food habits B-122
house for, *picture* B-143
protective coloration P-354
- Flickertail** State, popular name applied to North Dakota.
- Flies**. See in *Index* Fly
- Flight**, of animals
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bee, *diagram* B-78
birds B-120; compared to airplane B-120-1, *picture* A-81
- Flight**, U.S. Army Air Forces A-307
- Flight officers** A-307d
- Flinders, Matthew** (1774-1814), English navigator and hydrographer; surveyed and mapped Australian coast; probably first to discover and correct errors in compass caused by iron in ships.
- Flinders bar**, a piece of iron placed near a magnetic compass to decrease the deviation due to local influences.
- Flinders River**, in Queensland, Australia, flowing into Gulf of Carpentaria; map A-372a
- Flint, Frank Stewart** (born 1885), English poet, one of leading imagists; wrote chiefly about London ('In the Net of the Stars'; 'Cadenances'; 'Otherworld').
- Flint, Mich.**, city on Flint River 58 mi. n.w. of Detroit; pop. 151,543. A trading post was built here in 1820 at what was known as the "grand traverse" of Flint River; chartered as a city 1855; known as the "vehicle city" as early as 1904 when Buick Motor Co. was organized; now one of chief automobile cities of U. S. Principal manufactures are automobiles, auto accessories, paint and varnish, fabricated steel, tile. Community Music Association promotes numerous musical activities. Michigan School for Deaf; map M-153
- Flint**, a dull-colored quartz F-106
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- Flint and steel**, in making fire M-86, *picture* F-47
- Flint corn**, *picture* C-369
- Flint glass**, or crystal glass G-104
introduced in America A-174
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- Flint-lock**, a firearm F-48, 50, *pictures* F-49
- Flint River**, Ga., rises near Atlanta and flows 350 mi. to s.w. corner of state where it joins Chattahoochee to form the Apalachicola; drains area of about 8,000 sq. mi.; map G-56
- Floating** (swimming) S-345
- Floating bodies**, law of (principle of Archimedes) G-143, A-255, P-193, *picture* W-45
- Floating debt** S-291
- Floating dry dock**, *picture* H-216
- "Floating factory"** used in whaling W-80, *picture* W-78
- Floating gardens**, Mexico, *picture* M-136
- Floating plants** W-49
- Floating ribs**, in human skeleton, two lowest pairs of ribs, which are attached only to the vertebrae.
- Flocculi** (*flōk'ū-lī*), clouds around the sun S-328
- Flodden**, or Flodden Field, in Northumberland, England, near Scottish border; September 1513, English under Earl of Surrey defeated and killed James IV of Scotland; Scott's 'Marmion' gives account of the battle.
- Flood, Henry** (1732-91), Irish orator and political leader; handsome, witty, cultured; member Irish House of Commons 1759-83; British House 1783-90; sought complete legislative independence of Ireland.
- Flood**, excessive supply of water in river or lake sufficient to cause overflow F-106a-d
ancient: Assyrian and Babylonian B-9-10; Greek account D-58; Kish excavations confirm K-25
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ü=French u, German ü; gem, gō; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

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United States capitol, *picture* W-23
Flood plain, in physiography R-110

Flora
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Flora, Roman goddess of flowers and spring; identified in late Roman mythology with the Greek goddess Chloris, the wife of Zephyrus
May Day festival M-91
statue, *picture* E-334

Flora, all the plants of a region or of a division of geologic time.

Floral Park, N. Y., village about 15 mi. e. of New York City; pop. 12,950.

Florence, Ala., industrial city on Tennessee River in n.w. corner; pop. 15,043; stoves, wagons, cotton products; in rich mineral region; state teachers college; Muscle Shoals near by: *map* A-98
textile center A-98b
Wilson Dam A-98d, *picture* W-49

Florence, Italy (Italian Firenze), city in n.; pop. 320,000: F-107-8, I-166-70, *map* I-156
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Ponte Vecchio, *picture* I-165
Raphael's 'Madonna of the Chair' R-50, *picture* M-21
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textile industry T-64, *picture* T-67

Florence, S.C., railroad city and trade center for cotton and tobacco region, 96 mi. n.e. of Charleston; pop. 16,054; South Carolina Industrial School; state agricultural experiment station: *map* S-213

Florentine mosaic M-262

Flores (*flō-rēs*), westernmost island of Azores; 57 sq. mi.; pop. 11,000 distance from Newfoundland A-408

Flores, island of Netherlands Indies, e. of Java; over 5500 sq. mi.; pop. 385,000, mostly Papuan savages; exports sandalwood, rubber: *maps* E-142, A-332c

Flores Sea, between Flores and Celebes islands in Netherlands Indies: *map* A-372a

Florex, Howard W. (born 1898), British scientist, professor of pathology, Oxford University after 1935 penicillin and penatin A-223

Florian (*flō-rēs-ān'*), Jean Pierre Claris de (1755-94), French poet whose 'Fables' are part of every French schoolchild's education; all his works are delicately sentimental.

Floriculture, flower gardening G-6-12

Florída, a gulf state of U.S.; 58,560 sq. mi.; pop. 1,897,414; cap. Tallahassee: F-109-16, *maps* F-111, 112, U-188c

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Coligny sends Huguenot colony C-300

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ceded to England after Seven Years' War S-84

returned to Spain after Revolutionary War F-110, L-208

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Seminole Indians F-116: uprisings I-68, J-178

song, state F-164

transportation: Key West highway K-15; railroads and water ways F-114, 116, C-69

Florida, University of, state institution for men at Gainesville, Fla.; established 1905; arts and sciences, agriculture, engineering, law, education, pharmacy, commerce, journalism, architecture and allied arts; graduate school.

Florida Agricultural and Mechanical College, at Tallahassee, Fla.; state institution for Negroes, founded 1887; agriculture, mechanic arts.

Florida current G-185

Florida Island. *See* Solomon Islands

Florida Keys K-15

coral formation C-362

Florida moss, or Spanish moss A-95, *pictures* G-59, F-113: uses L-206

Florida opossum O-235

Florida parishes L-208

Florida State College for Women, at Tallahassee, Fla.; reorganized 1905 (established as seminary 1857); arts and sciences, education, home economics, art, music.

Florida Straits, formerly New Bahama Channel, waters separating Florida from Cuba and the Ba-

hamas, 60 to 100 mi. wide, *map* U-188c

Gulf Stream traverses G-185

Flor'in (from Latin *flos*, flower), Florentine gold coin, first used in 13th century; named from lily on the obverse; also monetary unit of the Netherlands, called also guilder and gulden, formerly worth about 68 cents in U.S. money, but now variable in value; coined in 5- and 10-florin pieces; English 2-shilling piece also called florin.

Flor'izel, in Shakespeare's 'A Winter's Tale', prince of Bohemia, lover of Perdita, the daughter of the king of Sicilia, whom he weds as a shepherdess: W-118-19

Floss silk, from outside of cocoons S-148, 150

Flotation process, for mineral refining M-122, G-112

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Flotilla, in U. S. Navy N-53, 55

Flotow (*flō'tō*), Friedrich von (1812-83), German composer of light opera ('Martha'; 'Alessandro Stradella'); pleasing melodies and lively dramatic action

'Martha', story O-231

Flot'sam, jetsam, and ligan (or lagan), English legal terms; flot-sam means shipwrecked goods which float; jetsam, goods thrown overboard which sink; ligan, goods which sink but are fastened to a buoy so that they may be recovered. The words are often used figuratively to refer to human wrecks.

Flounder, or plaice, a flatfish F-103-4, F-117, *picture* F-105

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Flour beetle, a small reddish beetle of the genus *Tribolium* that infests flour, meal, and other stored vegetable products; may be controlled by fumigating with carbon bisulphide.

Flour corn, or soft corn C-369

Flow, of liquids, explained P-193

Flowering maple. *See in Index* Abutilon

Flowering plants, spermatophytes, phanerogams, or seed plants, the highest group of plant life P-236, 244, *Outline* B-205

Flowerless plants, thallophytes, or cryptogams S-75, P-236, *Outlines* B-205, N-41

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Flowers, national. *See in Index* National flowers

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Flowers of sulphur, or sublimed sulphur S-324, C-176b

Floyd, John Buchanan (1807-63), American politician and soldier, born Blacksburg, Va.; governor of Va., 1850-53; secretary of war, 1857-60; commander of Confederate forces at Fort Donelson (brigadier general); relieved of command because he withdrew with some of his troops when he found surrender inevitable.

Floyd, William (1734-1821), signer of Declaration of Independence; born Brookhaven, N. Y.

Fluid, any substance so composed that it offers practically no resistance to any force tending to change its shape; applies particularly to gases and liquids; usually taken to mean the same as liquid. *See in Index* Liquid

Flukes, parasitic worms W-180a

Flume, in hydraulic power W-51

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phosphorescence and luminescence distinguished L-131

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X-rays cause X-200, *picture* X-199

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Fluoride, a compound of fluorine with an element

calcium (fluorite or fluorspar) C-175, L-131, M-181

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Fluorine, an extremely active gaseous chemical element C-175, 168

atomic structure, *diagram* A-361

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Fluorite. *See in Index* Fluorspar

Fluoroscope X-200, *picture* X-199

Fluorspar, or fluorite, a calcium fluoride (CaF₂), source of hydrofluoric acid; used as flux in steel making, in electrolytic production of aluminum, and as an ingredient in certain ceramic processes

fluorescent property L-131

mineral form M-183

relative hardness M-181

sources in U. S. I-15

Flux, of tea plant T-22

Flushing, L. I., part of borough of Queens, New York City, on Long Island, about 10 mi. e. of Brooklyn; airplanes, thread, rubber, silk.

Flushing, Netherlands, also Vlissingen, fortified port in s.w. of island of Walcheren; pop. 21,000; formerly important naval station;

shipbuilding, iron and steel works; its guns command mouth of Scheldt River: *map* B-87

Flute, a musical instrument W-135, M-323, *picture* M-322

range of, *diagram* S-198

Flux, a substance which promotes the fusing of metals or ores

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limestone, in smelting iron I-138

welding W-70

Fluxions, Newton's name for calculus

N-110

Fly, a two-winged insect of the order Diptera F-128-9. *See also in Index* names of individual insects called "flies," such as Dragon-fly, etc.

enemies: flycatchers F-129-30; swallow S-332; swift S-332; wasp W-34

fossilized in amber, *picture* A-140

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housefly F-128-9. *See also in Index*

Housefly

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Fly amanita (*āmanitā*), or fly

mushroom M-306, 307, *color plate*

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Flycatchers, a family of insect-eating birds F-129-30, *pictures* N-34, F-130

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Flying boat. *See in Index* Seaplane

Flying buttress, in architecture A-268, 269, *pictures* A-267, E-329

Flying Cross, Distinguished, U. S. D-31

Flying-dragon, a Malayan lizard L-170, D-88

Flying Dutchman, a legendary Dutch sea-captain, doomed for a rash oath or as punishment for crime to beat about the Cape of Good Hope till Judgment Day; name also applied to the phantom ship in which he sailed; the master of the ship was variously known as Captain Van Straaten and Vanderdecken; subject of opera by Wagner.

Flying-fish F-130, 73, *pictures* F-130, F-69

Flying fortress, heavy, long-range, multi-engined bombing airplane, carrying guns for self-defense; term originated with Boeing 2- and 4-engined types: *picture* A-74d

Flying fox, or fox-bat, a species of bat B-64

Flying lizard, or flying-dragon L-170, D-88

Flying mare, wrestling term W-183

Flying squirrel S-266, *pictures* S-265, 266

"Flying Tigers," name given to American Volunteer Group of fighter airplane pilots, under Brig. Gen. Claire L. Chennault, in Burma and s.e. China in 2d World War; group disbanded July 1942; most members inducted into U. S. Army Air Forces.

Fly mushroom, or fly amanita M-306, 307, *color plate* M-306a-b

Fly River, of Papua, British New Guinea; rises near w. border and flows s.e. entering Gulf of Papua by a delta; navigable for about half of its 800 mi. course: N-83, *map* E-142a

Fly-wheel, a heavy wheel whose weight resists sudden changes of speed, thus insuring uniform motion, *picture* I-741

principle of construction C-134

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FM. *See* Frequency modulation

Foul, a young horse H-345

Focal length, of lenses L-97

camera lens P-185

telescope T-39

Focal plane, of camera L-97

found by focusing P-181-2

human eye compared to E-349

Foch (*fōsh*), Ferdinand (1851-1929), French general and marshal of France, commander in chief of Allied armies in the first World War

F-131

assumes Allied command W-162

leads offensive of 1918 W-164

presents terms of armistice W-166

Fo'cus, of a lens L-97

camera P-182, 184, 185

eye E-349, *picture* L-98

telescope T-38, 39

Fod'der, coarse feed, such as hay, vegetables, given to live stock. *See in Index* Forage crops

Foehn. *See in Index* Föhn

Fog F-132, C-281

caused by: cold, *picture* P-195; Gulf

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Fogazzaro (*fō-gāt-sū'rō*), Antonio (1842-1911), Italian novelist and poet I-154

Fogg Art Museum, Cambridge, Mass., *table* M-392

Foggia (*fōd'gū*), city in e. Italy; pop. 58,000; market for agricultural produce of great Apulian plain; the emperor Frederick II often a resident: *map* I-156

Foggini (*fōd-gē'nē*), Giovanni Battista (1652-1725), Italian sculptor; follower of Bernini; did memorial to Galileo in church of Santa Croce, Florence.

Fo'go, one of Cape Verde Islands; about 200 sq. mi.; of volcanic origin; still active volcano 10,000 ft. high.

Föhn, or foehn (*fūn*), warm dry wind experienced particularly in valleys n. of Alps, also in Norway and Greenland; called chinook in U. S.: W-113

Foil, a light sword used in fencing F-24, *pictures* S-358, F-23

Foil, or leaf, term applied to thin pliable sheets of metal

aluminum A-138

gold G-113-14

silver S-152

Foix (*fwā*), Gaston de, Duke of Nemours (1489-1512), French general battle of Ravenna R-53

Fokine (*fō-kēn'*), Michel (1880-1942), ballet dancer and choreographer, born St. Petersburg (Leningrad), Russia; called "the father of contemporary ballet"; was choreographic director of Diaghileff's Russian ballet; his own choreographies include "The Dying Swan", "Prince Igor", "Les Sylphides", "Scheherazade".

Fokker, Anthony H. G. (1890-1939), Dutch airplane builder, born Java; inventor of Fokker plane used by Germans in first World War; inventions include synchronizing gear, making it possible to shoot through revolving propeller blades; founded, with others, Fokker Aircraft Corp., Glendale, W. Va.

Folding machine, bookbinding, *picture* B-186

Foley, John Henry (1818-74), Irish sculptor, born Dublin; monumental portraits and fanciful works ("Stone-wall Jackson", "Youth at the Stream").

Folger (*fōl'gēr*), Henry Clay (1857-1930), American capitalist, born New York City; with Standard Oil Co. of New York

Folger Shakespeare Library S-100g, L-106j, *picture* L-106l

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Welsh, *picture* F-133
Zulu wedding dance, *picture* A-35
Folkstone (*fōk'stōn*), seaport and resort of Kent, s.e. coast of England, about 65 mi. s.e. of London: important port in trans-Channel service; pop. 38,000: map E-270a
Folketing (*fōl'kē-ting*), lower house of Danish parliament D-52
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Folsom man, prehistoric North Ameri-

can man whose existence is assumed from the discovery of chipped stone weapons (Folsom points) with the bones of extinct bison near Folsom, N. M., a village 111 mi. n. e. of Las Vegas: A-148
Fomalhaut (*fō'māl-hāt* or *fō'mā-lō*), a bright star in the constellation Southern Fish S-274, *chart* S-275c
Fon'dant, in candy making C-72
Fond du Lac (*fōn du lāk'*), Wis., manufacturing and railroad city and trade center for agricultural region; on Lake Winnebago at mouth of Fond du Lac River; pop. 27,209; leather, refrigerators, lumber, tires, machinery: map W-124
Fonseca (*fōn-sā'kū*), Manoel Deodora da (1827-92), first president of Brazil (1891); dissolved Congress and declared himself dictator, but, finding himself unsupported by army and navy, resigned.
Fonseca, Gulf of, inlet of the Pacific, bordering on San Salvador, Honduras, and Nicaragua; fine natural harbor; U.S. naval base: map N-150c
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Fontaine, Jean de la. See in *Index* La Fontaine
Fontainebleau (*fōn-tēn-blō'*), forest-girdled town and resort of n. France, 35 mi. s.e. of Paris, on Seine River; pop. 18,000; magnificent royal palace; revocation of Edict of Nantes (1685); abdication of Napoleon (1814); Barbizon on n.w. edge of forest, made famous by painters: P-22
Fontana (*fōn-tā'nā*), Domenico (1543-1607), Italian architect; papal architect under Pope Sixtus V; built Lateran palace and Vatican library at Rome and the royal palace at Naples; in 1586 erected in front of St. Peter's the great Egyptian obelisk brought to Rome during Caligula's reign.
Fontane (*fōn-tā'nū*), Theodor (1819-98), German novelist and poet; works include books descriptive of wars, historical romances, novels of contemporary life, and ballads ('Effi Briest').
Fontanne, Lynn (born 1882), American actress, born London; played in U.S. after 1916; starred with husband, Alfred Lunt, in Theatre Guild productions ('Elizabeth the Queen'; 'Strange Interlude'; 'Reunion in Vienna'; 'Design for Living'; 'There Shall Be No Night').
Fontarabia. See in *Index* Fuenterabia
Fontenelle (*fōn-tūn-ēl'*), Bernard le Bovier de (1657-1757), French author, born Rouen; nephew of Corneille; won literary eminence in fields of poetry, drama, fiction, philosophy, and science ('Dialogues of the Dead'; 'Discourse on the Plurality of Worlds').
Fontenoy (*fōn-tūn-wā'*), village in w. Belgium, 45 mi. s.w. of Brussels; French defeated Allies (1745) in War of the Austrian Succession.
Foochow, China, also Fuchow, seaport on river Min; pop. 350,000: F-139, maps C-212, A-332c
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Fools, Feast of, festival popular in Europe in Middle Ages, in which the clergy and religious ritual were mimicked; donkey usually had a part in the grotesque celebration.
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Fools Court. *See* Jesters Court
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Foot and mouth disease, an infectious disease to which cattle and pigs are especially subject; sometimes transmitted to man: C-106
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Foot candle, unit of light measurement L-125
Foot, Andrew Hull (1806-63), American rear admiral, born New Haven, Conn.; commanded western flotilla in the Civil War, and captured Ft. Henry and Island No. 10.
Foot, Arthur (1853-1937), American composer, born Salem, Mass.; pianist and organist; compositions for orchestra ('In the Mountains'); musical settings for poems ('The Skeleton in Armor', 'Farewell to Hiawatha'); church music; songs.
Foot, Mary Hallock (1847-1938), American illustrator and novelist, born Milton, N.Y. ('The Led-Horse Claim'; 'The Valley Road').
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Foot-pound, in physics, unit of work P-191, 196
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Forain (fô-rân'), Jean-Louis (1852-1931), French painter and etcher; famous for his witty caricatures of all phases of Paris life.
Foraker Act (1900), act of Congress under which Puerto Rico was governed from the time when Spain ceded the island to the United States until 1917.
Foramen magnum ("great hole"), an opening in the occipital bone for the passage of the spinal cord S-156
Foraminifera, an order of single-celled water-dwelling animals with limy outer coats P-357
 shells make chalk C-137a
Forbes, John Murray (1813-98), railroad builder, born Bordeaux, France, of American parents; began building and managing railroads in w. U. S., 1846, including roads which later became the Chicago, Burlington & Quincy; during Civil War assisted Navy Department and organized propaganda bureau.
Forbes, Rosita (born 1893), British traveler and author; expeditions to Libyan desert and Asir; cinema expedition through Abyssinia ('The Secret of the Sahara-Kufara'; 'Adventure').
Forbes-Robertson, Sir Johnston (1853-1937), English actor, one of the most distinguished of his generation; first appeared with Irving and Mrs. Pat Campbell, later as star in his own company in 'As You Like It', 'Hamlet', 'Othello', 'Caesar and Cleopatra', 'The Passing of the Third Floor Back'; his 'Hamlet' considered finest portrayal since Booth.

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Force, in physics, anything that tends to produce, stop, or change motion P-190-3. *See also in Index* Energy; Mechanics; Power
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Forchheim (fôrkh'im), Germany, historic town in Bavaria, 15 mi. s.e. of Bamberg; residence of Carolingians, including Charlemagne.
"Forcing the City Gates," game P-255, *picture* P-255
Ford, Edward Onslow (1852-1901), British sculptor; best known for his portrait busts and statuettes ('Folly'; 'Applause'; Shelley memorial at Oxford University, England).
Ford, Ford Madox (Ford Madox Hueffer) (1873-1939), English novelist, critic, and poet; distinguished as stylist and as master of technique of novel; collaborated with Joseph Conrad in 'The Inheritors' and 'Romance'; wrote postwar series of novels ('Some Do Not'; 'No More Parades'; 'A Man Could Stand Up'; 'The Last Post'; 'No Enemy'); 'A Little Less than Gods' and other historical romances; 'Henry James: a Critical Study'; 'Collected Poems'; 'March of Literature'; 'Return to Yesterday' and 'Towards Tomorrow', autobiographical.
Ford, Guy Stanton (born 1873), historian and educator, born Salem, Wis.; professor of history and dean Graduate School, University of Minnesota 1913-38, president 1938-41; executive secretary, American Historical Association, managing editor *American Historical Review*; editor-in-chief, 'Compton's Pictured Encyclopedia'; editor, 'Harper Histories'.
Ford, Henry (born 1863), American manufacturer F-152-3
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 Edison Institute E-161, *pictures* M-154b, F-153. *See also in Index* Greenfield Village
 rubber plantations, Brazil B-227, *picture* B-226c
 thrift in business T-87
Ford, John (1586-1640?), English dramatic poet; work characterized by dramatic beauty and intensity of passion; 'The Broken Heart', one of most enjoyable of his plays.
Ford, Paul Leicester (1865-1902), American historian and novelist, born Brooklyn, N.Y., of cultivated family; widely traveled; edited writings of Washington, John Dickinson; wrote lives of Washington and Franklin ('The Honorable Peter Sterling', novel based on life of Grover Cleveland; 'Janice Meredith').
Ford City, Ontario, Canada. *See in Index* East Windsor
Fordham University, Catholic institution for men at New York City; founded 1841; arts and sciences, law, pharmacy, social service and

NATIONAL AND STATE FOREST AREAS IN THE UNITED STATES AND POSSESSIONS

| STATE | NATIONAL FORESTS (Acres) | STATE FORESTS (Acres) | STATE | NATIONAL FORESTS (Acres) | STATE FORESTS (Acres) |
|---------------------|--------------------------------|-----------------------------|----------------------|--------------------------------|-----------------------------|
| Alabama . . . | 466,709 | 432,354 | Nebraska . . . | 206,026 | 2,661 |
| Alaska . . . | 21,346,221 | 36,790 | Nevada . . . | 4,987,386 | 2,918 |
| Arizona . . . | 11,391,157 | 209,710 | New Hampshire . . . | 663,021 | 42,625 |
| Arkansas . . . | 1,955,339 | 312,085 | New Jersey . . . | 8,557,610 | 224,093 |
| California . . . | 19,292,344 | 176,365 | New Mexico . . . | 2,755,138 | 174,295 |
| Colorado . . . | 13,552,021 | 77,386 | New York . . . | 886,656 | 480 |
| Connecticut . . . | 1,223 | 49,763 | North Carolina . . . | 38,410 | 111,147 |
| Delaware . . . | 1,023,911 | 5,135 | North Dakota . . . | 143,823 | 46,620 |
| Florida . . . | 514,777 | 897,980 | Ohio . . . | 13,736,282 | 124,123 |
| Georgia . . . | 1,023,911 | 19,141 | Oklahoma . . . | 424,632 | 2,140,772 |
| Hawaii . . . | 514,777 | 77,385 | Oregon . . . | 24,165 | 6,306 |
| Idaho . . . | 19,849,903 | 14,000 | Pennsylvania . . . | 494,231 | 23,120 |
| Illinois . . . | 161,987 | 23,572 | Rhode Island . . . | 1,068,868 | 77,482 |
| Indiana . . . | 34,256 | 6,729 | South Carolina . . . | 521,502 | 50,219 |
| Iowa . . . | 100 | 353,146 | Tennessee . . . | 629,659 | 8,811 |
| Kansas . . . | 18,518 | 60,480 | Texas . . . | 7,624,294 | 52,010 |
| Kentucky . . . | 385,656 | 226,380 | Utah . . . | 160,765 | 53,969 |
| Louisiana . . . | 484,875 | 2,495,538 | Vermont . . . | 1,228,759 | 22,553 |
| Maine . . . | 47,513 | 2,243,064 | Virginia . . . | 9,635,533 | 1,173,269 |
| Maryland . . . | 60,480 | 2,885,391 | Washington . . . | 874,112 | 47,881 |
| Massachusetts . . . | 226,380 | 90,682 | West Virginia . . . | 1,274,002 | 189,055 |
| Michigan . . . | 1,686,078 | 513,520 | Wisconsin . . . | 8,603,581 | 120,000 |
| Minnesota . . . | 2,243,064 | | Wyoming . . . | | |
| Mississippi . . . | 927,227 | | | | |
| Missouri . . . | 1,016,948 | | | | |
| Montana . . . | 16,241,514 | | | | |

business administration; present name since 1907; graduate, law, and social service schools are co-educational: *picture* N-132

Fordlandia, rubber plantation in Brazil B-227, *map* B-226, *picture* B-226c

Fordney-McCumber Tariff Act H-219

Ford's Theater, Washington, D.C., theater in which Lincoln was shot; purchased by U.S. government in 1886; contains Lincoln Museum; across the street is Petersen House where Lincoln died; restored and refurbished by patriotic organizations.

Fore-and-aft rig, of ship S-119 sailing with, *picture* B-165

Forearm, the part of the arm between the elbow and the wrist bones of S-156

Forecasting weather W-59-62, B-49-50, H-377

floods F-106a

storms at sea S-298

Forecastle (*fôk's'l*), of ship S-118

Foreclosure, in law, the legal process by which a mortgagee may terminate the mortgagor's non-statutory equitable right to redeem the mortgaged property after breach of the condition of the mortgage.

Forefathers' Day (December 21) H-321

Foreign and Domestic Commerce, Bureau of U-227

Foreign body, in eye, ear, or stomach, first aid F-66

Foreigner, in U. S. *See in Index* Alien; Immigration, *subhead* United States

Foreign correspondents, of newspapers N-109

Foreign Economic Administration (FEA) N-13, R-146r

Foreign exchange F-153

1st World War affects F-153, M-221

gold standard affects F-153, M-221

international trade payments I-110c-d

operation and control I-111

Foreign Legion, French infantry regiment made up mainly of adventurers from all over the world; said to have been created by Louis Philippe in 1831; served in Mexico with

Maximilian, in Algeria, Morocco, and in France (1914-18, 1940); subject to the strictest military discipline; high reputation for valor.

Foreign missions C-233-4. *See also in Index* Missions, Christian

Foreign relations I-108-10. *See also in Index* International relations

Foreign Service, U. S. D-71, U-222

salaries of diplomats U-231

vocation V-326

Foreign trade C-321-3, I-110-12.

See also in Index Commerce; International trade; and *subhead* commerce under countries meaning and value I-110a

Foreign trade zones, or free ports T-13b

inland nations, importance to H-214

Foreign Wars of the U. S., Military Order of, patriotic and military organization founded 1894; membership limited to commissioned officers of U. S. Army who have served in wars against foreign powers; purpose, national defense against foreign aggression.

Foreman, spokesman for a jury J-229

Foreshortening, in drawing D-100

Forestay, of a sailboat B-164

Forest cantons, of Switzerland S-350-1

Forester, Cecil Scott (born 1899), English journalist and novelist, born Cairo, Egypt. His 'Captain Horatio Hornblower' is a brilliant novel of the Napoleonic period.

Foresters, Orders of, fraternal, beneficent, and benevolent orders first founded in England; written history dates from 1790 when order was known as Ancient Royal Order of Foresters; later superseded by Ancient Order of Foresters; introduced into America, 1832; Independent Order of Foresters founded at Newark, N.J., 1874, by seceding bodies; Ancient Order of Foresters of America founded 1889 by further seceding groups (name changed to Foresters of America 1895).

Forest Park, Ill., residential suburb of Chicago about 2 mi. w.; pop. 14,840; formerly called Harlem.

Forest Park, in St. Louis, Mo. S-10

Forest products. *See also in Index* Camphor; Charcoal; Lumber; Rubber; Tannin; Wood maple sugar M-56, 57 resins R-78 tar and pitch T-12 turpentine T-165-6 wood pulp P-57-61

Forest reserves F-157, *pictures* F-158. *See also in Index* National parks Adirondack reserve, N. Y. A-21 Belgian Congo, for gorillas G-123 conservation movement C-342, 343

Forestry. *See* Forests and forestry

Forestry Association, American. *See in Index* American Forestry Association

Forests, petrified F-143

Arizona A-288, N-22c, *map* A-289

Wyoming W-192

Forests and forestry F-154-9. *See also in Index* Lumber; Trees; Wood. For list of national and state forests *see table* on this page

Africa A-36, *map* A-42b

airplane service F-159

American Forest Week A-248.

H-321-2

animals injurious to Z-230

Asia A-330, I-34, *map* A-332a

Australia A-371, *map* A-372b

climate benefited by F-154

conservation F-156-9, C-342, 343, *picture* E-145h

Alaska A-104, 106

Canada C-56, F-159

Christmas trees C-229d

Delaware D-40a

Germany G-68, B-153

Michigan M-153

New York A-21

Pennsylvania P-114

T. Roosevelt promotes R-152, C-343

Vermont V-287

deforestation F-156, T-131

Asia: China C-221b

Europe E-322: Spain S-226

flood control in relation to F-106d

United States F-155, 156, U-185:

Indiana I-47-8

Europe E-320, 322, *map* E-318a

fires and fire fighting F-155, 159,

pictures F-156, 157, 158: camp fire

precautions C-47a; parachutes

used P-62; regrowth of evergreens

after fire E-145c; sequoia resists

fire S-79

flood and drought control problem

F-106c-d, T-131

forest rangers, duties F-159: fighting

fire, *picture* F-157

growth, climate determines C-270b,

271

insect and other pests of forests

F-155-6

national forests, U. S. N-22f, U-228,

F-157, *pictures* F-157, 158. *See*

also table on this page

North America N-152, F-154-5, *map*

N-150a

paper sources P-61

petrified forests P-143

reforestation F-106d, F-156-9, *pic-*

ture F-158

sequoia and redwoods S-79-80

shelterbelt established F-157

soil S-191b, d, *map* S-191c: how soil

benefits from trees T-131

South America S-207, A-139-40, *map*

S-208d, *pictograph* S-204

state forests, U. S. *See table* on this

page

swamp type W-49

United States F-154-5, 156, U-194,

maps U-194, N-150a: proportion

of land used, *map* L-61a, *graph*

L-61b

vocational opportunities V-326

western settlement affected by U-186

Forest service

Canada F-159

Key—câpe, ât, fâr, fâst, what, fâll; mē, yēt, fērn, thêre; ice, bît; rōw, wón, fôr, nôt, dç; cûre, bût, rûde, fûll, bûrn;

United States F-159, *pictures* F-154, 156, 157, 158; Arbor Day A-247; conservation work U-228
wilderness areas N-22f
Forest Week F-159, A-248, H-321-2
Forfeiture, in law, term applied to loss of property, personal or real, because of misconduct, crime, or breach of promise.
Forgery, in law, the making or altering of any written instrument for the purpose of fraud and deceit; common examples are the signing of another person's name to a check, and increasing the amount of a check by changing the figures.
Forget-me-not (*Myosotis*) F-159
how to plant G-11
Forging, drop T-110
Forked lightning, or chain lightning, *picture* L-135
Forks and Knives K-33. *See also in Index* Cutlery
Forli, Melozzo da. *See in Index* Melozzo da Forli
Form, in printing B-184, *pictures* B-184, 185
Formaldehyde, a strongly antiseptic gas used in fumigation F-159-60
chemistry of production B-110
used in plastics P-245f, k
Formal gardens, *pictures* G-6, 7
For'malin, a solution of formaldehyde in water C-176b, F-159
Formentera (*fôr-mên-tâ-râ*), one of the Balearic Isles B-17
For'mic acid
chemical composition C-176b
poison in ant's sting A-211
Formica, a synthetic plastic P-246
For'micary, an ant nest A-213, *pictures* A-212, T-52b
Formicidae (*fôr-mis'i-dê*), ant family A-213. *See also in Index* Ant
Formo'sa, also Taiwan, semi-tropical island off e. coast of China; 13,908 sq. mi.; pop. 5,225,000; F-160, *maps* J-186, A-332b-c
camphor industry C-41
tea T-21-2, 26
Forms of address. For list, *see in Index* Address, forms of
Formulas, chemical C-167-167a, 171
Forrest, Edwin (1806-72), American tragedian, until the advent of Edwin Booth the most famous; robust physique and powerful voice; his best characters were Othello, Lear, Richard III.
Forrest, John, Baron (1847-1918), Australian surveyor, explorer, and statesman; first premier and treasurer of Western Australia (1890-1901); president Australian Federal Council (1897); introduced free homestead system; established Agricultural Land Bank; first Australian to receive peerage.
Forrest, Nathan Bedford (1821-77), Confederate Civil War general, born Tennessee; noted cavalry leader; became lieutenant general; captured Fort Pillow 1864; distinguished service in several battles, including Chickamauga and Nashville, and in cavalry raids in Tennessee, Mississippi, and Alabama: C-255
Forster, Edward Morgan (born 1879), English novelist, born London; during 1st World War did Red Cross work in Egypt and wrote 'Alexandria: a History and a Guide'; best known novel 'A Passage to India', a fine, firsthand study of Anglo-Indian relations.
Forster, John (1812-76), English biographer and historian ('Life of Dickens'; 'Lives of the Statesmen of the Commonwealth').

Forster, William Edward (1818-86), English liberal statesman, member of Commons 1861-86; urged national education; secretary for Ireland 1880-82, before Phoenix Park plot.
'Forsyte Saga, The', related novels by John Galsworthy, including 'The Man of Property', 'The Indian Summer of a Forsyte', 'In Chancery', 'Awakening', 'To Let'; a second series includes 'A Modern Comedy', 'The White Monkey', 'The Silver Spoon', 'Two Forsyte Interludes', 'Swan Song': E-288
Forsyth (*fôr-sith*'), Alexander J. (1769-1843), Scottish clergyman and inventor F-50
Forsythia, a genus of Asiatic shrubs of the olive family; several species cultivated in parks and gardens, called golden-bell from the small yellow bell-shaped flowers that cover the bushes before the leaves appear; named in honor of William Forsyth, British botanist.
Fort (*fôr*), Paul (born 1872), French poet; rhythmic verse printed like prose ('Ballades françaises').
Fort, U.S. Army U-224
Fort Abraham Lincoln, N.D., on west side of Missouri River, south of Mandan, N.D.; last headquarters of General Custer; original fort called Fort McKean, built 1872 on hill above present fort: N-165
Fortaleza (*fôr-tâ-lâ-zâ*), Brazil, also Ceará (*sâ-â-râ*'), port and capital of state of Ceará on n.e. coast: pop. 150,000: *maps* B-226, S-208b
Fort Anne National Park, at Annapolis Royal, Nova Scotia; has historical museum: N-22f
Fort Astoria, fur-trading post founded by employees of John Jacob Astor 1811, on site of present Astoria, Ore.: F-226, *picture* F-227
British capture F-227, O-247
Fort Beauséjour National Park, a Canadian historical park in n. e. New Brunswick; has historical museum: N-22f
Fort Belvoir (formerly Fort Humphreys), U. S. Army post 14 mi. s.w. of Alexandria, Va.
Fort Benjamin Harrison, U.S. Army post near Indianapolis, Ind.
Fort Benning, Ga., U.S. military institution for the training of infantry officers; near Columbus, Ga.; about 100,000 acres.
Fort Benton, Mont., town on Missouri River at head of navigation; important early supply center for gold camps; pop. 1227: *map* M-243
Fort Bliss, U.S. military post 5 mi. n.e. of El Paso, Tex. E-257
Fort Bragg, U.S. Army post 10 mi. n.w. of Fayetteville, N. C.; established 1918, named for Gen. Braxton Bragg; 120,000 acres.
Fort Buford, N.D., village at head of low-water navigation on Missouri River.
Fort Caroline, Huguenot settlement in Florida F-110
Fort Chartres, Ill., French settlement on Mississippi River, n. of Kaskaskia; founded 1720: I-13
Fort Churchill. *See in Index* Churchill
Fort Collins, Colo., town 60 mi. n. of Denver; pop. 12,251; in fertile irrigated district; best sugar, cement, flour; Colorado State College of Agriculture and Mechanic Arts.
Fort Crèvecoeur (*fôr krêv-kûr*'), post built by La Salle on Illinois River, near site of Peoria: L-66, H-274
Fort Crook, U. S. Army post near Omaha, Neb.

Fort Custer, U.S. Army post 6 mi. w. of Battle Creek, Mich.
Fort Dearborn, U.S. fort built in 1803 on site of Chicago; destroyed 1812; rebuilt and used till 1837: C-192
Fort de France, capital of Martinique; pop. 45,000; port on w. coast; French military and naval station.
Fort Delaware, on Pea Patch Island, Delaware Bay; Civil War prison.
Fort Devens, U.S. Army post 1 mi. s. of Ayer, Mass. (about 10 mi. e. of Fitchburg); established 1917.
Fort Dix, a U.S. Army post 1 mi. s.w. of Wrightstown, N. J. (about 30 mi. n.e. of Camden); established during 1st World War.
Fort Dodge, Iowa, trade and railroad center 70 mi. n. of Des Moines on Des Moines River; pop. 22,904; oatmeal, plaster, gypsum, clay products, gloves: *map* I-120
Fort Dodge, Kan., village on Arkansas River 145 mi. w. of Wichita end of cattle trail C-112
Fort Donelson, Confederate fortification on Cumberland River in Tennessee, 63 mi. n.w. of Nashville; national cemetery; made national military park 1928: *map* C-253
Grant captures G-132
Fort Douaumont (*dô-ô-môn*'), hill and village near Verdun V-283
Fort Douglas, now part of Winnipeg; scene of fur trade wars: F-227
Fort Dummer, early settlement in Vermont V-287
Fort Duquesne (*dû-kân*'), French (*dû-kên*'), French fort on site of present city of Pittsburgh, Pa. P-224, 226
French and Indian War F-194, W-15
Forte (*fôr'tâ*), in music, loud; fortissimo, very loud; fortississimo, extremely loud.
Fort Edward, N.Y., village on Hudson River 40 mi. n. of Albany; pop. 3620; fort built here 1755 was an important post during French and Indian War and Revolution.
Fort Elfsborg, early Swedish settlement in New Jersey N-92
Fort Erie, Canada, village in Ontario, on Lake Erie at head of Niagara River, opposite Buffalo, N.Y., on site of old Ft. Erie; battle area during War of 1812; pop. 2383
bridge at B-261
Fort Eustis, U.S. Army post 18 mi. n.w. of Newport News, Va., a cantonment during 1st World War, later an artillery post.
Fort Fisher, Confederate earthworks in North Carolina defending entrance to port of Wilmington
Porter captures P-305
Fort Francis E. Warren, U.S. Army post 3 mi. n.e. of Cheyenne, Wyo.; formerly Fort David A. Russell, established 1867.
Fort Frederica National Monument Project, in Georgia N-22
Fort Frontenac (*frôn-tû-nâk*'), French colonial fort on present site of Kingston, Ontario, Canada K-23
Fort Gaines, fortification guarding w. entrance to Mobile Bay
Farragut captures F-13
Fort Garry, Canada, now part of Winnipeg W-114
Red River rebellion R-62
Fort George, former fort in Canada on Niagara River, opposite Ft. Niagara; won by Americans May 1813.
Fort Green, earthworks erected on Long Island during Revolutionary War; site now Ft. Green Park, Brooklyn: B-249
Fort Griswold. *See in Index* Groton, Conn.

ü=French u, German ü; gem, go; thin, then; ù=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

Forth, Firth of, Scotland, estuary (50 mi. long) of Forth River on e. coast, *maps* E-279, E-270a cantilever bridge B-240b, E-158, *table* B-342

Fort Harrod, at Harrodsburg, first settlement in Kentucky; built by James Harrod in 1775 pioneer's cabin, *picture* U-238

Fort Hays Kansas State College, at Hays, Kan.; founded 1901; arts and sciences, graduate school.

Fort Henry, in n.w. Tenn., 11 mi. w. of Ft. Donelson; captured Feb. 1862 by Federal gunboats under Commodore Foote, acting with land force under Grant; *map* C-253

Fort Howard, in Md., U.S. military post on North Point at junction of Patapsco River and Chesapeake Bay.

Fortin barometer B-50

Fortissimo. *See in Index* Forte

Fort Jackson, Confederate fort on Mississippi River 80 mi. below New Orleans; vainly besieged 6 days, April 1862, by Farragut's fleet.

Fort Jefferson National Monument, off coast of Florida N-22

Fort Kearney (*kār'ni*), Neb. *See in Index* Kearney, Neb.

Fort Knox, Ind. *See in Index* Fort Sackville

Fort Knox, Ky., military reservation 30 mi. s. of Louisville; U. S. government gold depository built here (1936) as part of program to shift nation's gold reserve into interior.

Fort Laramie, a fort built in 1834 in e. Wyoming at junction of North Platte and Laramie rivers national monument N-22

Fort Lauderdale, Fla., popular winter resort 24 mi. n. of Miami, yachting and fishing center; pop. 17,996; Seminole War fort built here 1838; Seminole village near by; farming, citrus-fruit growing, commercial fishing; *map* F-112

Fort Leavenworth, Kan., military post, 2 mi. from Leavenworth; army school, federal prison; established 1827 to protect Santa Fe trail.

Fort Leonard Wood, U. S. Army post at Newburg, Mo., about 50 mi. s.e. of Jefferson City; established 1940.

Fort Lewis, U. S. Army post 17 mi. s. of Tacoma, Wash.; founded 1917.

Fort Lou'don, English colonial post in Tennessee T-48

Fort McClellan, U. S. Army post 6 mi. n. of Anniston, Ala.

Fort McHenry, former U. S. military post in Baltimore harbor B-34 bombarded (1814) N-24 flag F-98, *color plate* F-90 national monument N-22

Fort Mackinac (*māk'i-ng*), one of oldest fortifications in U.S., on Mackinac Island, Mich.

Pontiac captures M-154

Fort McPherson, U.S. military post s. of Atlanta, Ga.; about 250 acres.

Fort Madison, Iowa, industrial city 18 mi. s.w. of Burlington on Mississippi River; pop. 14,063; railroad shops; farm tools; state prison: I-120, *map* I-120

Fort Man'dan, near present site of Bismarck, N.D. L-99

Fort Marion National Monument, former name of Castillo de San Marcos N-21

Fort Massac (*mās'āk*), Ill., state park I-13

Fort Matanzas National Monument, Fla. N-22

Fort Meade, U. S. Army post 2 mi. s. of Sturgis, S. D.; established 1878; named for Gen. G. G. Meade.

Fort Meade (Fort George G. Meade), U. S. Army reservation 15 mi. n.w. of Annapolis, Md.; 7,500 acres; established during 1st World War as Camp Meade.

Fort Meigs (*mēgz*), former U.S. fort on Maumee River, n.w. Ohio; famous for defense against English and Indians during War of 1812 Sioux at S-219-20 Tecumseh at T-28

Fort Mims, old fort 35 mi. n. of Mobile, Ala.; site of massacre I-68

Fort Monroe, U.S. military post at Old Point Comfort, Va., commanding entrance to Hampton Roads; coast artillery school; *map* C-253 Jefferson Davis imprisoned D-20

Fort Morgan, former U.S. military post at e. entrance to Mobile Bay: A-98b Farragut captures F-13

Fort Moultrie (*mōl'tri*), fort on Sullivan's Island at entrance to Charleston harbor; abandoned by Federals in Civil War and became one of strong Confederate defenses flag F-98, *color plate* F-90

Fort Myer, Va., U. S. Army post 4 mi. s.w. of Washington, D. C., on Potomac River; formerly Fort Whipple; renamed in 1881 for Brig. Gen. A. J. Myer, creator of Army Signal Corps.

Fort Myers, Fla., city in s. w. on Caloosahatchee River, 15 mi. from coast; pop. 10,604; fort built here in 1839 to check Seminole Indians; western terminus of Cross-State Canal; shipping center for citrus fruits, winter vegetables, fish, and cattle; seat of Edison Botanical Research Corporation; *map* F-112

Fort Nassau, Dutch trading post, established in 1614, now Albany, N.Y.

Fort Necessity, stockade near Uniontown, Pa., built 1754; made national battlefield site 1931; rebuilt 1932 surrender of Washington W-15

Fort Niagara, old fort at mouth of Niagara River, N. Y., overlooking Lake Ontario; its strategic position at head of Great Lakes made it important in history; first fort here built by La Salle in 1678, rebuilt by French in 1725 and 1756; captured by British in French and Indian War, 1759; surrendered to U. S. in 1796; recaptured by British in 1813, restored to U. S. in 1815 by Treaty of Ghent; rebuilt in 1934 Father Millet Cross N-22

Fort Nisqually (*niz'kwā-lē*), built 1833 near Tacoma, Wash. T-1

Fort Nonsense, in Morristown National Historical Park N-22b

Fort O'glethorpe, at Dodge, Ga., 11 mi. from Chattanooga, Tenn.

Fort Omaha, U.S. military post at Omaha, Neb.; headquarters Seventh Corps Area.

Fort Orange, erected by Dutch on site of city of Albany, N.Y. A-108 golf played in 1659 G-118

Fort Ord, U. S. Army post 13 mi. n.e. of Monterey, Calif.

Fort Peck Dam D-8, M-211, *table* D-357

Fort Phil Kearney (*kār'ni*), fort built 1866-67 on Piney Fork of Rock Creek at foot of Big Horn Mountains in Wyoming; abandoned 1868 after peace treaty with Sioux.

Fort Pickens, fort on Santa Rosa Island, Fla., at entrance to Pensacola harbor.

Fort Pillow, Confederate fort on Mississippi, 40 mi. above Memphis, Tenn.; occupied by Federals June 1862; recaptured April 1864, "massacre of Ft. Pillow."

Fort Pitt, English post on site of present Pittsburgh P-226

Ottawa Indians attack P-117

Fort Pontchartrain (*pōn-shār-trān'*), French trade post at Detroit D-57

Fort Porter, former U.S. military post on Niagara River at Buffalo.

Fort Prud'homme (*prü-dôm'*), French post built by La Salle in 1682 on present site of Memphis T-48

Fort Pulaski (*pū-lās'ki*), Civil War fort near Savannah, Ga. national monument N-22

Fort Putnam, American fort at West Point in Revolutionary War.

Fort Raleigh, reconstructed fort on Roanoke Island, N. C.; part of Cape Hatteras National Seashore Recreational Area Project: N-22e

Fort Riley, U.S. military post 4 mi. n.e. of Junction City, Kan. (65 mi. w. of Topeka); cavalry school; established 1852.

Fort Rosecrans, U. S. Army post 6 mi. from San Diego, Calif., on w. side of San Diego harbor: S-24

Fort Sackville, British fort taken by George Rogers Clark in 1779 and named Fort Patrick Henry; originally named Fort Knox; rebuilt and renamed Fort Knox 1788; later abandoned: C-259

Fort St. Louis, La Salle's post at Starved Rock on Illinois River I-13

Fort Sam Houston, U.S. military post at San Antonio, Tex. S-21

Fort San Marco, original name of Fort Marion, St. Augustine, Fla. S-7 national monument N-22

Fort San Mateo, Spanish fort at mouth of St. John's River, in Florida F-110

Fort Schuyler. *See in Index* Fort Stanwix

Fort Scott, Kan., industrial city on Marmaton River 87 mi. s. of Kansas City in agricultural and dairying region; pop. 10,557; horse and mule market; railroad shops; cement, oil, brick: *map* K-4

Fort Sheridan, U.S. military post on Lake Michigan 25 mi. n. of Chicago.

Fort Sill, U.S. Army post 4 mi. n. of Lawton, Okla.; founded 1868 as Camp Wichita; name changed 1869 by Gen. Philip H. Sheridan in honor of Gen. Joshua W. Sill.

Fort Smith, Ark., city on w. border at junction of Arkansas and Potomac rivers; pop. 36,584; large wholesale trade; furniture, glass, cotton products, scissors; center Ark. coal and gas region; railroad shops: A-298, *map* A-296

Fort Snelling, U.S. military post near St. Paul; national cemetery early history M-194, S-11

Fort Stanwix (now Fort Schuyler), at present site of Rome, N. Y.; treaties with Six Nations made here 1768 and 1784; rebuilt and named Fort Schuyler 1776

flag raised over, *picture* F-83 national monument project N-22

Fort Sullivan. *See in Index* Fort Moultrie

Fort Sum'ter, in Charleston harbor, S. C.; now inactive; scene of first Civil War battle: F-160-1, C-252 Buchanan sends help B-256

Fort Thomas, Ky., residential city on Ohio River opposite Cincinnati, O.; army post; pop. 11,034.

Fort Ticonderoga, in N. Y. on outlet from Lake George to Lake Champlain; built by French in 1755 and called Fort Carillon; captured by British 1759; now a museum. Revolutionary War R-89: Allen captures A-128; Arnold at A-309

Fortu'na, in Roman mythology, goddess of fortune F-161

Fortunate Isles, or **Isles of the Blest**, Canary Islands C-70

Fortunatus (*fôr-tû-nâ'tûs*), hero of European folk-tale, possessor of proverbial inexhaustible "Fortunatus purse" and wishing-cap which would transport him wherever he desired to go.

'Fortunes of Nigel, The', historical novel by Sir Walter Scott, published 1822; portrays times of James I of England and gives vivid description of Alsatia.

'Fortune Teller, The', painting by Mieris, *picture* E-335

Fort Union, N. D., fur-trading center F-227

Fortuny (*fôr-tq'nê*), Mariano (1838-74), great Spanish painter and etcher, dazzling colorist, dominant influence in Spanish art until rise of impressionism.

Fort Vaux (*ôô*), at Verdun, France, in 1st World War V-283

Fort Washington, early military post on Manhattan Island; surrendered to English under Sir William Howe Nov. 16, 1776.

Fort Wayne, Ind., railroad and industrial center in n. e. on Maumee River; pop. 118,410. The French outpost on this site was surrendered to the English at end of French and Indian War, but English lost it to the Indians under Pontiac in 1763; was held by Indians, part of time with aid of English, until taken by "Mad Anthony" Wayne in 1794. Incorporated as a town in 1829 and as a city in 1840. Concordia College: I-48, *map* I-46 manufactures I-48

Fort Wayne, Treaty of T-28

Fort William, British post in India, founded 1696 to protect traders; nucleus of Calcutta.

Fort William, Ontario, Canada, shipping center at head of Lake Superior; pop. 26,277: F-161, *map* C-50c

warfare between fur companies F-227

Fort William Henry, at s. end of Lake George, on site of present Caldwell, N. Y.; surrendered by English to French and Indians under Montcalm (1757).

Fort Wood, N. Y., site of Statue of Liberty, *picture* N-124

Fort Worth, Tex., 4th largest city of state; pop. 177,662: F-161, T-58, *map* T-56

Forty and Eight, Society of A-176

"Forty Immortals," members of French Academy A-4

"Forty-niners," participants in the gold rush to Calif. in 1849: C-34, P-221b

Death Valley D-22

Denver a camping place D-55

"Forty Thieves," *See in Index* Ali Baba

Forty-two line Bible, or **Gutenberg Bible** B-105, P-346-7, L-102, *picture* B-179

For'um, open space in center of a Roman city used as a market place, for political assembly, and for amusements; most famous at Rome: R-138, *pictures* R-141, A-259

Forward pass, in football F-150, *pictures* F-148, 151b

Foscolo (*fôs'kô-lô*), Ugo (1778-1827), Italian writer and patriot, born in Ionian Islands; educated in Venice; grief at transfer of Venice to Austria by Napoleon voiced in his 'Letters of Jacopo Ortis';

also famous for 'Hymn to the Grave'.

Fosdick, Harry Emerson (born 1878), American clergyman and educator, noted for liberal views; born Buffalo, N. Y.; ordained Baptist minister, 1903; professor of practical theology Union Theological Seminary; pastor Park Avenue Baptist Church, New York City, and later of Riverside Church (non-sectarian); ('On Being a Real Person').

Fosdick, Raymond Blaine (born 1883), lawyer and public official, born Buffalo, N. Y.; 1913 investigated police organization in Europe for Rockefeller Bureau of Social Hygiene; civilian aide to Gen. Pershing 1919; under secretary general League of Nations 1920; president Rockefeller Foundation after 1926.

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Fossil turquoise. *See in Index* Odonatolite

Foster, Sir George Eulas (1847-1931), Canadian statesman, long one of the leaders of Conservatives; in Macdonald cabinet 1885-88 as minister of marine and fisheries; minister of finance 1888-96; minister of trade and commerce 1911-21; headed Canadian delegation in League of Nations assembly 1920 and elected vice-president of assembly.

Foster, John Watson (1836-1917), American lawyer and diplomat, born Pike County, Ind.; in service during Civil War; minister to Mexico, Russia, and Spain; secretary of state, 1892-93; helped settle Bering Sea controversy and other international disputes ('A Century of American Diplomacy'; 'Arbitration and the Hague Court'; 'Diplomatic Memoirs').

Foster, Stephen Collins (1826-64), American song writer F-164, M-316

Fostoria, Ohio, manufacturing city and livestock center 35 mi. s.e. of Toledo; pop. 13,453; carbons, wire, flour

Foucault (*fô-kô'*), Jean Bernard Léon (1819-68), French physicist, noted

for his investigations in mechanics and optics; devised Foucault pendulum; measured velocity of light by means of revolving mirror gyroscope G-192

proves earth's rotation E-132-3

Foucault pendulum, a long pendulum with heavy bob used to demonstrate the rotation of the earth: E-132-3

Fouché (*fô-shâ'*), Joseph, Duke of Otranto (1763-1820), French revolutionist and statesman; twice minister of police; active in suppressing Robespierre; head of provisional government after the battle of Waterloo.

Foujita (*fô-jê'tû*), Tsuguharou (born 1886), Japanese painter and lithographer; removed to Paris 1913; still lifes, landscapes, and portraits, but especially noted for paintings of animals, particularly cats.

Foulard (*fû-lârd'*), a soft, lightweight printed silk dress fabric, or a cotton fabric resembling it.

Foul ball, in baseball B-56

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Fountain, *diagram* H-367, *picture* G-6

Fountain grass, an ornamental perennial plant (*Pennisetum ruppelii*) of the grass family, native to Africa. One foot high, has narrow leaves and branching feathery clusters of flowers, pink or purple; used as a border plant.

Fountain of Castalia, at Delphi D-44 earthquake destroys G-164

'Fountain of the Innocents', also called 'Fountain of the Nymphs', sculpture by Goujon, in Paris, France S-58, *picture* S-59

Fountain of Youth P-302, A-295

Fountain pen P-104, 106

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point A-133

Fouqué (*fô-kâ'*), Friedrich, Baron de la Motte. *See in Index* La Motte-Fouqué

Fouquet (*fô-ké'*), Jean, or Jehan (1420?-77?), French artist, court painter to Charles VII and Louis XI; superb illuminator and miniaturist, also historical painter; originality and fine draftsmanship in portraits.

Fouquet, Nicolas (1615-80), superintendent of finance, and procureur-général under Louis XIV; patron of arts; amassed great fortune and power; put in prison for life 1664.

Fouquieria (*fô-ki-ê'ri-â*). *See in Index* Ocotillo

Four-cycle gas engines G-20, 21, 22

Fourdrinier (*fûr-drin'i-êr*) machine, for making paper P-58, *picture* P-60

Four-eyed fish M-296-7, *picture* M-296

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Four-II clubs F-164-5

"Four Horsemen," in football F-151d

'Four Horsemen of the Apocalypse', novel by Ibañez I-1, S-237

Fourier (*fə-rē-yā'*), Francois Charles Marie (1772-1837), French socialist and political economist; originator of the coöperative community plan known as "Fourierism," tried unsuccessfully at Brook Farm and elsewhere: S-180

Fourier, Jean Baptiste Joseph (1768-1830), French mathematician; accompanied Napoleon to Egypt and was made governor of Lower Egypt; chief work in theory of heat and of numerical equations; Fourier series, important in mathematical physics.

Fourment (*fər-mān'*), Hélène, wife of Rubens R-171

Four Mountains, Islands of the, group in Aleutian Islands.

Four-Nation Declaration, Joint (Moscow Pact), 2d World War W-179g-h, R-146r

Fournier (*fər-nē-yā'*), Pierre Simon (1712-68), French type-founder and writer on typography point system of type sizes T-172

Four-o'clock, or marvel of Peru, a common garden plant (*Mirabilis Jalapa*), of the four-o'clock family; introduced into the United States from South America; called four-o'clock because the flowers open late in afternoon and evening inheritance of colors H-284, *photographs* H-283a-b

Four-o'clock family, or Nyctaginaceae (*nīk-tā-gi-nā'sē-ē*), a family of plants, shrubs, trees, native chiefly to warm regions; includes bougainvilleas, sand verbenas, umbrellawort, four-o'clock, and pisonias.

Four-post bed, colonial A-169, *picture* A-170

Four-Power Treaty, concluded at Washington Conference by United States, Great Britain, France, and Japan P-10

Fourteen Points, terms of peace suggested by President Wilson in 1918, in an address to Congress W-111 Germany and W-110-11, W-174

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Fourth dimension, in Einstein theory E-213

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Foussa (*fə'sa*), catlike animal M-17

Fovea centralis, or central pit, of eye E-350, *diagram* E-349

Fowl, domestic P-336-9. See also in *Index* Poultry

Fox, Charles James (1749-1806), British statesman, one of the greatest orators of his day; one of Pitt's chief rivals and opponents; dissipated, but honest and progressive in public affairs; advocated religious freedom, abolition of slave trade, electoral reform, and other liberal causes; foreign secretary 1782-83 and 1806; supported the cause of the American colonists by his speeches in Parliament.

Fox, George (1624-91), English religious reformer, founder of the Society of Friends or Quakers; often imprisoned; sincere, firm.

Fox John, Jr. (1863-1919), novelist, born Bourbon Co., Ky.; wrote 'Trail of the Lonesome Pine', and other stories of the Cumberland Mts.

Fox, Margaret (1833-93), a leader in Spiritualist movement S-259

Fox, an animal of the dog family F-165-6, *pictures* F-166, N-31 fur F-165, *picture* F-223: farming, Pribilof Islands A-102

length of life, average, *photograph* A-198

Reynard the fox F-166

silver fox, *picture* F-228

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Fox, flying, or fox-bat, a species of bat, found chiefly in Malay Archipelago; so called because of its resemblance to fox: B-64

'Fox and the Grapes, The', one of Aesop's fables. Unable to reach the delicious-looking grapes, the fox insists they must be sour.

Foxe, John (1516-87), English divine, author of 'Book of Martyrs' M-72

Foxe Channel, an arm of the ocean n. of Hudson Bay and w. of Baffin Island; named after Luke Foxe (1586-1635), who in 1631 explored the region: H-348, *map* C-50c

Fox-fire, light emitted by foxed or rotten wood due to the presence of luminescent fungi P-176

Foxglove, a genus (*Digitalis*) of tall biennial or perennial plants of the figwort family, bearing in racemes numerous white to purple tubular flowers that loosely resemble the fingers of a glove; the large oval leaves yield the drug digitalis, a heart stimulant how to plant G-10

Fox grape G-135, 136

Foxhound D-79, 82

Fox Indians, an Algonquian tribe originally living in Wisconsin, chiefly in vicinity of Lake Winnebago and Fox River; closely related to the Sauk or Sac tribe.

Fox Islands, name given to easternmost group of the Aleutian Islands.

Fox River, Wis., rises in s. center, flows n.e. 260 mi. through Lake Winnebago to Green Bay explorations W-126

Fox shark, or thresher shark S-103, *picture* F-72

Fox snake S-172

Fox squirrel S-266

Foxtail millet M-176

Fox terrier D-82

Foy, Eddie, stage name of Edwin Fitzgerald (1856-1928), comedian, born New York City; sang and danced in boom towns of the West; was playing at Iroquois Theater in Chicago when this theater burned down with great loss of life, in 1903.

"F. P. A." See in *Index* Adams, Franklin Pierce

Fra Angel'ico. See in *Index* Angelico, Fra

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Fractures, first aid for F-65

Fra Diavolo. See in *Index* Diavolo, Fra

Fragonard (*frā-gō-nār'*), Jean-Honoré (1732-1806), French painter of the rococo period, whose gay delicate paintings express the frivolous luxury of Louis XV's time; decorations for pavilion for Mme. Du Barry now in Metropolitan Museum, N.Y.

'Fram', Nansen's ship P-282

Amundsen uses A-190

Frames, innings in bowling B-207

Framework knit fabrics K-33

Framingham, Mass., industrial town on Sudbury River, 20 mi. s.w. of Boston; pop. 23,214; straw hats, shoes, paper specialties, carpets; state teachers college; seat of first state normal school in U. S.

Frampton, Sir George James (1860-1928), English sculptor; excelled in use of colored marbles and bronze in purely decorative effects; 'Socrates Teaching', Calcutta statue of Queen Victoria, 'Peter Pan', and Edith Cavell monument are considered his best works statue of Peter Pan, *picture* B-51

Franc, monetary unit of France; no nominal value established in terms of gold; exchange value about 4 cents; coined in aluminum-bronze. Also monetary unit of Switzerland; no nominal gold value; exchange value about 20 cents

Poincaré devalues F-182

France (*frāns*), Anatole, pen name of Jacques Anatole Thibault (1844-1924). French novelist and critic, most distinguished modern master of graceful humor and pure French style; won Nobel prize 1921 ('The Crime of Sylvester Bonnard'; 'Thais'; 'The Opinions of M. Jerome Coignard'; 'The Red Lily'; 'The Revolt of the Angels'; 'The Man who Married a Dumb Wife', a play; 'Our Children' and 'Little Sea Dog' for children); *picture* F-197

story of 'Penguin Island' P-109-10

France, country in w. cent. Europe; 212,659 sq. mi.; pop. 42,000,000; cap. Paris: F-170-86, *maps* F-179, E-326c, d, f, *Outline* F-184-5

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 768-814 Charlemagne
 814-840 Louis I, the Pious
 843-877 Charles I, the Bald
 877-879 Louis II
 879-882 Louis III
 879-884 Carloman
 884-887 Charles II, the Fat
 [888-898 Odo of Anjou]
 893-922 Charles III, the Simple
 [922-923 Robert I of Anjou]
 [923-936 Rudolph of Burgundy]
 936-954 Louis IV
 954-986 Lothair
 986-987 Louis V

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 987-996 Hugh Capet
 996-1031 Robert I
 1031-1060 Henry I
 1060-1108 Philip I
 1108-1137 Louis VI, the Fat
 1137-1180 Louis VII
 1180-1223 Philip II, Augustus
 1223-1226 Louis VIII
 1226-1270 Louis IX, the Saint
 1270-1285 Philip III
 1285-1314 Philip IV
 1314-1316 Louis X
 1316-1322 Philip V
 1322-1328 Charles IV

VALOIS LINE
 1328-1350 Philip VI
 1350-1364 John II

1364-1380 Charles V
 1380-1422 Charles VI
 1422-1461 Charles VII
 1461-1483 Louis XI
 1483-1498 Charles VIII
 1498-1515 Louis XII
 1515-1547 Francis I
 1547-1559 Henry II
 1559-1560 Francis II
 1560-1574 Charles IX
 1574-1589 Henry III

BOURBON LINE

1589-1610 Henry IV
 1610-1643 Louis XIII
 1643-1715 Louis XIV
 1715-1774 Louis XV
 1774-1792 Louis XVI
 [1792-1799 First Republic]
 [1799-1804 Napoleon Bonaparte, First Consul]

THE FIRST EMPIRE

1804-1815 Napoleon I, Emperor

THE BOURBON RESTORATION

1814-1824 Louis XVIII
 1824-1830 Charles X
 1830-1848 Louis Philippe
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 Moroccan crises M-259-60: Theodore Roosevelt's influence R-150
 church disestablished P-227
 Poincaré P-272
 Clemenceau C-262-3
 World War of 1914-18 F-181
 reasons for entering W-150, 151
 military events W-153-4, 156-66:
 Calais C-19
 peace settlement W-173-4
 reconstruction F-181-2
 debt to U. S. W-177
 national debt in 1918 N-13
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 Briand B-235
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 troops withdrawn from Rhineland G-75
 difficulties in Syria S-362
 security and postwar militarism F-182: Alsace-Lorraine A-137
 Daladier F-182, 184, picture W-178c
 Munich pact F-182, E-326b, C-421
 war with Germany F-182, 184, E-326b, W-178d, e-i
 prewar policy W-178b-c
 coöperation with England W-178e, E-277
 German occupation W-178i
 loss of Alsace-Lorraine A-137
 surrender and armistice F-184, W-178i-j
- Fascist state replaces Third Republic*
 alliance with England severed W-178j
 De Gaulle movement W-178j
 Vichy régime F-184, W-178j
 collaboration with Nazis W-178j
 loss of Syria W-178r
 "liberation government" in N. Africa W-179g
- Francesca (frän-chēs'kä)*, Piero della, or Franceschi, Piero de' (1418?-1492), Italian painter of the Umbrian school, also a mathematician; painted by geometrical principles; great realist and master in perspective; wrote on geometry and art.
- Francesca da Rimini (frän-chēs'kä dā rē'mē-nē)* (died 1288?), wife of Malatesta of Rimini, who, having fallen in love with her husband's brother, was killed by her husband; story told in Dante's *Inferno*.
- Franche-Comté (fränsh-cōn-tā')*, old province in e. France in Rhone basin, now departments of Doubs, Haute-Saône, Jura, and part of Ain; conquered by Louis XIV in 1674; map F-179
 held by duke of Burgundy C-153
 franchise, constitutional or political right of suffrage S-318-19. See also in *Index* Suffrage
- Franchise*, a special privilege or exemption granted to public utility companies P-364
 fraud in H-229
- Francía (frän'chä)* (1450-1518) (real name Francesco Raibolini), Italian painter and goldsmith; greatest of early Bolognese school; Raphael influence dominates his paintings.
- Francía, José Gaspar Rodríguez* (1757?-1840), dictator of Paraguay 1814-40; austere, gloomy, ruthless despot, whose very name Paraguayans dared not pronounce (he was El Supremo during life and El Defunto when dead) and who for 26 years kept Paraguay a hermit nation, knowing neither want, wars, nor will of its own; described by Carlyle and by Edward L. White ('El Supremo'): P-66
- Francis I* (1708-65), Holy Roman emperor, husband of Maria Theresa F-186
 Maria Theresa M-63
- Francis II* (1768-1835), Holy Roman emperor F-186
 Napoleon marries daughter N-9
- Francis I* (1494-1547), king of France F-186
 American exploration A-145: Cartier C-90
 builds part of Louvre E-328
 furniture of period I-99
 Henry VIII of England and H-278
 patron of art: Leonardo da Vinci V-300; saltcellar by Cellini, picture M-124
- Francis II* (1543-60), France F-186, M-74
- Francis, Sir Philip* (1740-1818), English politician, reputed author of the 'Letters of Junius' hostility to Hastings H-234
- Franciscan Nuns, or Poor Clares* F-187
- Franciscans, or Gray Friars*, also called Minorites and "Begging Brothers," Roman Catholic religious order founded by St. Francis of Assisi: F-187
 early missions in U.S. M-234: Arizona N-22d; California C-32-3, pictures C-34; Texas T-59, 60
 Ximenes X-197-8
- Francis Ferdinand* (1864-1914), archduke of Austria
 assassination W-149
- Francis Joseph I* (1830-1916), emperor of Austria and king of Hungary F-186
- Francis of Assisi (äs-sē'zē)*, Saint (1182-1226), founder of Franciscan order; festival Oct 4: F-187
 manger scene, origin of, Christmas custom C-227
 monastery at Assisi, picture I-171
- Francis of Paola (pä'ō-lä)*, Saint (1416?-1507), Italian saint, founder of Minims, mendicant order of Roman Catholic church; strictest of ascetics; festival April 2.
- Francis turbine* W-52
- Francis Xavier (zäv'i-ēr)*, Spanish häv-yér', Saint (1506-52), Spanish Jesuit missionary X-197
- Frank (fränk)*, César (1822-90), French (Belgian-born) composer, "successor of Berlioz" whom he surpassed in power of invention; his music, like the man himself, sincere, straightforward, modest, combines classical and modern forms; 'Les Béatitudes', an oratorio, considered his greatest work: M-315
- Frank, Harry Alverson* (born 1881), American writer of travel books, born Munger, Mich. ('A Vagabond Journey Around the World'; 'East of Siam'; 'Four Months Afoot in Spain'; 'The Lure of Alaska').
- Frank, James* (born 1882), German physicist, born Hamburg, Germany; came to U. S. in 1935; taught at Johns Hopkins University, 1935-38, later at University of Chicago; shared Nobel prize in physics, 1925, with Gustav Hertz for "discovery of the laws governing the impact of an electron upon an atom."
- Frankke (fräng'kü)*, August Hermann (1663-1727), German Protestant clergyman and philanthropist; professor of theology, University of Halle; founded several institutions among which was a school for out-cast children.
- Franco, Francisco* (born 1892), dictator of Spain F-187, S-231d-32
- François de Sales (frän-swä' dü sāl)*, Saint (1567-1622), French churchman, bishop of Geneva; his book 'Introduction to the Devout Life' has been translated into almost every language; patron of journalists; festival January 29.
- Fran'colin*, name for birds of the genus *Francolinus*, allied to partridge; richly colored plumage; about 50 forms inhabit Asia and Africa; game birds, good for food.
- Franco'nia* ("land of the Franks"), medieval German duchy chiefly e. of Rhine in valley of Main G-67, 71
- Franconian line, or Salian line*, of German emperors (ruled 1024-1125) G-71. For list see in *Index* Holy Roman Empire
- Franconia Notch*, N.H. N-85
- Franco-Prussian War* (1870-71) F-187-8
 Bismarck and Ems dispatch B-147
 Metz, siege of M-131
 Rezonville, picture F-180
 Rome abandoned by French I-158
 Sedan, surrender at F-188, S-73
 South German states B-148
 treaty F-188: Alsace-Lorraine ceded to Germany A-137
 Versailles—proclamation of German empire V-289
- Frank (frängk)*, Bruno (born 1887), German writer of plays, poetry, short stories and novels; left Germany during Third Reich ('Twelve Thousand'; 'The Days of the King'; 'Trenck'; 'Lost Heritage').
- Frank, Glenn* (1887-1940), American publicist and university president, born at Queen City, Mo.; editor of *Century Magazine*; president of University of Wisconsin 1925-37; editor of *Rural Progress*.
- Frank'enstein*, student in Mary Shelley's novel 'Frankenstein', who fashions a soulless man monster, repulsive yet yearning for sympathy; lamenting its loneliness, it follows its creator everywhere.
- Frankfort, Ind.*, city 40 mi. n.w. of Indianapolis; pop. 13,706; fruit, grain, and vegetable trade; railroad shops; enamel ware, plumbing fixtures, station wagon bodies.
- Frankfort, Ky.*, capital of state, on Kentucky River 50 mi. e. of Louisville, in blue grass region; tobacco,

Key—cāpe, āt, fār, fāst, whāṭ, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dē; cūre, būt, rīde, fūll, bārñ;

- live stock; coal and oil fields reached by steamboats; pop. 11,492; shoes, alcoholic liquors; Kentucky State Industrial College, for Negroes; founded 1786: map K-11, pictures K-14
- Frankfort, Mich., village on n.w. shore of lower peninsula, 25 mi. n. of Manistee; pop. 1642
train ferry terminal R-41
- Frankfort, Diet of G-72
- Frankfort, Treaty of, 1871, terminating Franco-Prussian War F-188
- Frankfort-on-the-Main, Germany, also Frankfurt, in s. on Main River; pop. 555,000: F-188-9, map G-66, pictures G-73, G-110
modern church, picture A-271
publishing, beginnings B-190
- Frankfort-on-the-Oder, Germany, also Frankfurt, trade center 50 mi. s.e. of Berlin; pop. 71,000; connected by canal with Elbe and Vistula; 3 annual fairs; manufactures and railroad shops: map G-66
- Frankfurter, Felix (born 1882), American jurist and educator, born Vienna, Austria; Harvard University law professor 1914-38; appointed associate justice U. S. Supreme Court 1939 by President Roosevelt ('The Public and Its Government').
- Frankincense, a fragrant gum resin from certain trees of the genus *Boswellia* found in East Africa, Arabia, China, India, etc.; also called olibanum; used as incense; name also given to other tree gums.
- Franking privilege, the right of sending mail free of charge allowed by governments to their officials.
- Frankland, Sir Edward (1825-99), English chemist and physicist, formulator of the doctrine of chemical valency and discoverer (with Lockyer) of helium.
- Frankland, State of. See in Index Franklin, State of
- Franklin, Benjamin (1706-90), American scientist and statesman F-189-190, pictures F-191, R-11, R-92
Academy of Philadelphia E-181
Albany Congress R-81-2, A-108
'Autobiography' F-190, L-106j
benevolent trusts P-161
birthday begins Thrift Week H-320
broom-corn B-250
colonial deputy postmaster general P-320
Constitutional Convention F-190
daylight saving D-21
Declaration of Independence D-28, F-190, picture R-81
diplomatic service F-189-90
first American magazine M-27
hobby H-313
inventor and scientist F-189
bifocal lenses S-240
electrical chime, picture E-221
fluid theory of electricity E-221
harmonica H-225
lamp L-56-7
lightning experiments E-231
stove S-304, A-171, picture A-172
telegraphy experiments T-30
persuades Pulaski to aid colonists P-365
Poor Richard's Almanac C-23, A-176
Stamp Act S-269, F-190
subscription library L-106a
thrift rules T-86
toleration of opinions, quoted on C-347c
treaty of peace R-92
- Franklin, Edward Curtis (1862-1937), American chemist, born Geary City, Kan.; professor organic chemistry Stanford University 1906-29; chief of division of chemistry, U.S. Public Health Service, 1911-13; chemist, Bureau of Standards, 1918; researches on liquid ammonia as an electrolytic solvent.
- Franklin, Sir John (1768-1847), British admiral and Arctic explorer, discoverer of Northwest Passage; perished with all his party on Baffin Bay: P-280
- Franklin, William Suddards (1863-1930), American physicist and electrical engineer, brother of Edward Curtis; born Geary City, Kan.; professor of physics at Iowa State College, Lehigh University, and Massachusetts Institute of Technology.
- Franklin, District of, Canada, in n. part of Northwest Territories; about 554,032 sq. mi.: N-170, map C-50b-c
- Franklin, State of, or Frankland (later Tennessee) T-48
Sevier president S-85
- Franklin, Pa., city on Allegheny River 9 mi. s.w. of Oil City; pop. 9948; oil and natural gas, lumber, engines, tools.
- Franklin, battle of, in American Civil War; Federals under Schofield defeated Confederates under Hood near Franklin, town 17 mi. s. of Nashville (Nov. 30, 1864); one of bloodiest of the war: map C-253
- Franklin and Marshall College, institution for men at Lancaster, Pa.; controlled by Reformed Church in the U. S.; formed 1853 by union of Franklin College (founded 1787) and Marshall College (founded 1836); liberal arts.
- Franklin College, at Franklin, Ind.; established by Baptists in 1834 but now non-sectarian; liberal arts.
- Franklin Institute (of the State of Pennsylvania for the Promotion of Mechanical Arts), in Philadelphia, society established in 1824; particularly interested in the application of science to industry; holds scientific and popular lectures; conducts schools in mechanical subjects; grants medals and certificates for outstanding inventions.
aid from Franklin bequest P-161
- Franklinite, a valuable ore of iron, zinc, and manganese occurring as a metallic, iron-black, opaque spinel in isometric crystals: P-32
- Franklin's grouse G-181
- Franklin's gull G-186
- Franklin's Tale, in 'Canterbury Tales' C-162
- Franklin stove S-304
invented A-171, picture A-172
- Franklin Union, Boston, industrial school and technical institute; opened in 1908; established, with assistance from the City of Boston and Andrew Carnegie, by Franklin Foundation: P-161
- Franks, warlike Germanic tribes that first settled along lower Rhine River as early as 3d century A.D.; kingdom finally included greater portion of w. Germany and territory which now forms Belgium, France, and Netherlands: M-159, F-180
Charlemagne rules C-144-6
Charles Martel defeats Saracens C-153
Clovis unites C-282
costume, picture D-107: jewelry, picture G-27
France named for C-282, F-171
invade Gaul E-322-3
partition of Verdun (843) E-323, V-283
repel Vandals V-271
repel Visigoths G-123
- Franz (fränts), Robert (1815-92), German composer; was director of music at University of Halle, but forced to give up because of deafness; best songs distinguished for tenderness and beauty, rank next to those of Schubert and Schumann.
- Franzen (fränt-sän'), Frans Michael (1772-1847), Swedish writer, clergyman, and educator, born Finland; excelled in writing religious songs and biography.
- Franz Josef Land, U.S.S.R. See in Index Fridtjof Nansen Land
- Franz Joseph Glacier, New Zealand, picture G-95
- Frasch (fräsh), Herman (1852-1914), American chemist and inventor, born Germany; made important inventions in connection with petroleum products and oil refining
improves sulphur mining S-323
- Fraser, James Earle (born 1876), American sculptor, born Winona, Minn.; shows poetic conception, and great skill in handling material ('End of the Trail', a memorial to the North American Indian; busts of Theodore Roosevelt and Augustus Saint-Gaudens; Lincoln statue at Jersey City; John Ericsson Monument, Washington, D.C.; "Buffalo nickel"). His wife, Laura Gardin Fraser, is also a sculptor of note.
- Fraser, Laura Gardin (Mrs. James Earle Fraser) (born 1889), American sculptor, born Chicago, Ill.; designed many medals.
- Fraser, Simon, explorer of Fraser River, British Columbia (1808); leader of North-West Fur company: F-226
- Fraser River, Canada, chief river of British Columbia; two forks unite near Fort George, flowing s. 740 mi. into Strait of Georgia; gold deposits: map C-50b
salmon canneries B-246
- Fraserville, Quebec, Canada. See in Index Rivière du Loup
- Fraternal societies, social groups organized as "lodges," primarily to provide sickness and life insurance; are controlled by members, and have rituals and forms of secret societies; earlier societies were open only to men, later ones are open to both men and women; developed greatly following the Civil War. See also in Index names of various organizations
- Fraternities and sororities, college U-258. See table on next page
- Fraud
advertising, regulation A-24, 24a
- Fraunhofer (froun'hö-fēr), Joseph von (1787-1826), German optician and physicist; studied dark lines of absorption spectra: S-241, 242
- Fraunhofer lines S-241, 242
- Frazee, John (1790-1852), American sculptor; portrait busts: S-62
- Frazier, Sir James George (1854-1941), British anthropologist and classical scholar, born Glasgow, Scotland; most famous work is 'The Golden Bough' in 12 volumes, a comparative survey of primitive religions of the world; also wrote 'The Worship of Nature' and other books on myths and magic; translated classical works, including 'Fasti' of Ovid and works of Pausanias.
- Frazier-Lemke Act R-146f, j
- Frazil' ice I-2
- Fréchette (frä-shét'), Louis Honoré (1839-1908), French-Canadian poet, generally acknowledged the greatest of his people; his lyrics are inspired by intense patriotism, love of nature, beauties of friendship and family ties ('Veronica', a tragedy; 'Papineau' and 'Felix Poutre', historical plays): C-66

GENERAL COLLEGE FRATERNITIES

| FOUNDED | FRATERNITY | WHERE FOUNDED | FOUNDED | FRATERNITY | WHERE FOUNDED |
|---------|------------------------------|--------------------------------------|---------|---------------------|----------------------------------------|
| 1904 | Acacia | University of Michigan | 1889 | Phi Kappa | Brown University |
| 1895 | Alpha Chi Rho | Trinity College, Hartford, Conn. | 1852 | Phi Kappa Psi | Jefferson College |
| 1832 | Alpha Delta Phi | Hamilton College | 1850 | Phi Kappa Sigma | University of Pennsylvania |
| 1913 | Alpha Epsilon Pi | New York University | 1906 | Phi Kappa Tau | Miami University |
| 1904 | Alpha Gamma Rho | Ohio State University | 1918 | Phi Mu Delta | Wesleyan University, Middletown, Conn. |
| 1914 | Alpha Kappa Lambda | University of California | 1915 | Phi Pi Phi | Chicago |
| 1921 | Alpha Kappa Pi | Newark College of Engineering | 1910 | Phi Sigma Delta | Columbia University |
| 1916 | Alpha Lambda Tau | Oglethorpe University | 1873 | Phi Sigma Kappa | Massachusetts Agricultural College |
| 1914 | Alpha Mu Sigma | Cooper Union Institute of Technology | 1868 | Pi Kappa Alpha | University of Virginia |
| 1912 | Alpha Phi Delta | Syracuse University | 1904 | Pi Kappa Phi | College of Charleston |
| 1845 | Alpha Sigma Phi | Yale University | 1895 | Pi Lambda Phi | Yale University |
| 1865 | Alpha Tau Omega | Richmond, Va. | 1833 | Psi Upsilon | Union College |
| 1901 | Beta Kappa | Hamline University | 1856 | Sigma Alpha Epsilon | University of Alabama |
| 1839 | Beta Theta Pi | Miami University | 1909 | Sigma Alpha Mu | College of the City of New York |
| 1854 | Chi Phi | Princeton University | 1855 | Sigma Chi | Miami University |
| 1841 | Chi Psi | Union College | 1921 | Sigma Delta Rho | Miami University |
| 1890 | Delta Chi | Cornell University | 1921 | Sigma Mu Sigma | Tri-State College |
| 1844 | Delta Kappa Epsilon | Yale University | 1869 | Sigma Nu | Virginia Military Institute |
| 1827 | Delta Phi | Union College | 1827 | Sigma Phi | Union College |
| 1847 | Delta Psi | Columbia University | 1901 | Sigma Phi Epsilon | University of Richmond |
| 1899 | Delta Sigma Phi | College of the City of New York | 1908 | Sigma Phi Sigma | University of Pennsylvania |
| 1859 | Delta Tau Delta | Bethany College | 1897 | Sigma Pi | Vincennes University |
| 1834 | Delta Upsilon | Williams College | 1917 | Sigma Tau Phi | University of Pennsylvania |
| 1825 | Kappa Alpha | Union College | 1910 | Tau Delta Phi | College of the City of New York |
| 1865 | Kappa Alpha (Southern Order) | Washington and Lee University | 1910 | Tau Epsilon Phi | Columbia University |
| 1905 | Kappa Delta Rho | Middlebury College | 1899 | Tau Kappa Epsilon | Illinois Wesleyan University |
| 1911 | Kappa Nu | University of Rochester | 1856 | Theta Chi | Norwich University |
| 1869 | Kappa Sigma | University of Virginia | 1847 | Theta Delta Chi | Union College |
| 1909 | Lambda Chi Alpha | Boston University | 1919 | Theta Kappa Phi | Lehigh University |
| 1912 | Omicron Alpha Tau | Cornell University | 1870 | Theta Nu Epsilon | Wesleyan University, Middletown, Conn. |
| 1914 | Phi Alpha | George Washington University | 1864 | Theta Xi | Rensselaer Polytechnic Institute |
| 1912 | Phi Beta Delta | Columbia University | 1907 | Triangle | University of Illinois |
| 1848 | Phi Delta Theta | Miami University | 1898 | Zeta Beta Tau | New York City |
| 1904 | Phi Epsilon Pi | College of the City of New York | 1847 | Zeta Psi | New York University |
| 1848 | Phi Gamma Delta | Jefferson College | | | |

GENERAL COLLEGE SORORITIES

| FOUNDED | SORORITY | WHERE FOUNDED | FOUNDED | SORORITY | WHERE FOUNDED |
|---------|--------------------|------------------------------|---------|-------------------|------------------------------|
| 1885 | Alpha Chi Omega | De Pauw University | 1874 | Gamma Phi Beta | Syracuse University |
| 1851 | Alpha Delta Pi | Wesleyan College, Macon, Ga. | 1870 | Kappa Alpha Theta | De Pauw University |
| 1909 | Alpha Epsilon Phi | Barnard College | 1897 | Kappa Delta | Virginia State Normal School |
| 1904 | Alpha Gamma Delta | Syracuse University | 1870 | Kappa Kappa Gamma | Monmouth College |
| 1897 | Alpha Omicron Pi | Barnard College | 1919 | Phi Delta | New York University |
| 1872 | Alpha Phi | Syracuse University | 1852 | Phi Mu | Wesleyan College, Macon, Ga. |
| 1893 | Alpha Xi Delta | Lombard College | 1910 | Phi Omega Pi | University of Nebraska |
| 1909 | Beta Phi Alpha | University of California | 1867 | Pi Beta Phi | Monmouth College |
| 1888 | Beta Sigma Omicron | University of Missouri | 1917 | Sigma Delta Tau | Cornell University |
| 1895 | Chi Omega | University of Arkansas | 1874 | Sigma Kappa | Colby College |
| 1888 | Delta Delta Delta | Boston University | 1912 | Theta Phi Alpha | University of Michigan |
| 1874 | Delta Gamma | Oxford, Miss. | 1914 | Theta Upsilon | University of California |
| 1917 | Delta Phi Epsilon | New York University | 1898 | Zeta Tau Alpha | Virginia State Normal School |
| 1902 | Delta Zeta | Miami University | | | |

Frederic, Harold (1856-98), American novelist; 'Damnation of Theron Ware', intensive study of middle class America; 'The Copperhead', a story of the Civil War.

Frederick I, Barbarossa (1123?-90), Holy Roman emperor, "in many respects the ideal emperor of the Middle Ages" F-190
charters University of Bologna U-260

leads Third Crusade C-404, F-190
opens Charlemagne's tomb A-1

Frederick II (1194-1250), Holy Roman emperor F-190
develops Sicily S-140
Fifth Crusade C-406

Frederick III (1415-93), Holy Roman emperor A-382-3

Frederick III (1609-70), king of Denmark; he transformed Denmark into an absolute monarchy and made crown hereditary; unsuccessful wars with Sweden 1657-60.

Frederick VI (1768-1839), king of Denmark and Norway; succeeded 1808 (previously regent); joined Armed Neutrality of North and was punished (1801) by destruction of fleet by English (read Campbell's 'Battle of the Baltic'); suffered similarly for neutrality

again in 1807; then allied self with Napoleon and was compelled by Allies (1814) to surrender Norway and Sweden as punishment.

Frederick VII (1808-63), Denmark, succeeded 1848; in his reign Schleswig-Holstein troubles grew ripe for Bismarck's intervention in next reign.

Frederick VIII (1843-1912), Denmark, succeeded father, Christian IX, in 1906; father of Haakon VII of Norway, brother of King George I of Greece and of Queen Alexandra of England.

Frederick I (1657-1713), first king of Prussia (1701), previously elector of Brandenburg (1688-1701), and duke of Prussia; patron of learned men, but vain and extravagant; gained title of king for aiding Emperor Leopold I in War of Spanish Succession
statue of S-59

Frederick II, the Great (1712-86), Prussia F-192-3
Berlin beautified by B-99a
Carlyle's biography C-85
develops army A-308
educational decree E-176
literature in his reign G-62
partition of Poland P-276, map P-278

patron of arts: sculpture S-59
Seven Years' War S-84, M-63, F-192
Voltaire and V-335

Frederick III (1831-88), German emperor and king of Prussia (March 9 to June 15, 1888); son of William I, first German emperor; father of William II; commanded at Sedan and siege of Paris in Franco-Prussian War; liberal, cultured, friend of parliamentary govt.; died of cancer.

Frederick I, the Victorious (1425-76), elector palatine 1451-76; tried to dethrone Emperor Frederick III; great military leader.

Frederick II, the Wise (1482-1556), elector palatine (succeeded 1544); commanded imperial army at siege of Vienna 1529; became Protestant through influence of Melancthon.

Frederick III, the Pious (1515-76), elector palatine (succeeded 1559); laid foundation for systematic Calvinism; aided French Huguenots.

Frederick IV, the Upright (1574-1610), elector palatine (succeeded 1583), noted for firm support of Protestantism.

Frederick V (1596-1632), elector palatine and "winter king" of Bohemia;

through his marriage with Elizabeth, daughter of James I of England, ancestor of the Windsor (Hanover) line of English kings; king of Bohemia 1619-20, thereafter in exile
Thirty Years' War T-80
Frederick III, the Wise (1463-1525), elector and duke of Saxony; refused imperial throne 1519 and suggested election of Charles V; friend of Luther and Melancthon, whom he invited to teach at University of Wittenberg founded by him.
Frederick Henry (1584-1647), Prince of Orange; youngest son of William the Silent and brother of Maurice of Nassau; ended the 80-year struggle with Spain by the treaty of Münster (1648); his term as stadholder (1625-47) is accounted the golden age of the Dutch Republic.
Frederick William I (1688-1740), king of Prussia; came to throne 1713; eccentric, parsimonious but able administrator; real founder of modern Prussia; left Prussia world's third military power and on sound financial basis
trains Frederick the Great F-192
Frederick William III (1770-1840), king of Prussia; came to throne 1797; good, weak man under whom Prussia was almost effaced by Napoleon, but restored by Congress of Vienna and rehabilitated by the great ministers Stein and Hardenberg; member of Holy Alliance; his queen Louise, a heroine of modern Germany; founder of University of Bonn (1818).
Frederick William IV (1795-1861), king of Prussia; came to throne 1840; reactionary idealist; reluctantly granted Prussian constitution following revolutionary uprisings of 1848; insane in later years; brother (later William I), regent.
Frederick William (1620-88), the "Great Elector" of Brandenburg and duke of Prussia; succeeded 1640; laid foundation for greatness of Prussia, previously ruined by Thirty Years' War P-359
Berlin improved by B-99a
Frederick William (born 1882), crown prince of Prussia, abdicated 1918; commander of Fifth German army in 1st World War
Second battle of the Aisne W-162-3
Verdun V-282-3, W-159
Frederick, Md., city 44 mi. n.w. of Baltimore in rich agricultural section; makes iron and steel, clothing, hosiery, brushes, brick; pop. 15,802; Hood College, state school for deaf; scene of Whittier's 'Barbara Frietsch'; home and burial place of Francis Scott Key: *map* M-78
Fredricksburg, Va., city 60 mi. n. of Richmond, on Rappahannock River at head of tidewater; pop. 10,066; national and Confederate cemeteries; state teachers college; various manufactures; strategic point in Civil War: *map* V-306
Fredericksburg, battle of F-193, *map* C-253
Hancock at H-207
Fredericksburg and Spotsylvania County Battle Fields Memorial, in Virginia; established 1927: Civil War battles.
Fredericton, New Brunswick, cap. and railroad center on St. John River; pop. 8830; shoes, boats, lumber, cotton; coal-mining; Provincial University: *map* C-50c
Fredericksburg castle, picture D-51
Fredo'nia, N.Y., village 45 mi. s.w. of

Buffalo; pop. 5738; grape-growing section; first to use natural gas for lighting (1821); teachers college.
Fredrikshald (*frä'driks-häl*), Norway. *See in Index* Halden
Fredrikstad, Norway, seaport and manufacturing town at mouth of river Glommen, 50 mi. s.e. of Oslo; pop. 14,000; export lumber trade; Hankø, most fashionable Norwegian resort, near by: *map* E-326d
Freeboard, on ships S-128
Free city, city with an independent government D-46, C-243. *See also in Index* City-states
Bremen B-234
Danzig D-14
Frankfort F-189
Hamburg H-203-4
Hanseatic League H-212
Freedman
Greek S-159
Roman S-160
Freedmen's Bureau, established by U. S. at close of Civil War for guardianship and education of emancipated Negroes; provided government aid from 1865 to 1870
Johnson opposes J-223
Freedom. See in Index Liberty
Freedom of speech B-109
Alien and Sedition Acts A-127
Constitution guarantees U-216
Freedom of the press P-348
Alien and Sedition Acts A-127
Bill of Rights B-109
Constitution guarantees U-216
Charles X of France suppresses C-152
established in America N-122
Milton's 'Areopagitica' M-178
public or private control C-324b
Zenger's trial N-122
Freedom of the seas, in international law I-110
one of "14 Points" W-111
Free enterprise. See in Index Laissez-faire
"Free French" W-178j
Free-hand drawing D-99-101
Freehold, in law, an interest in real property for an uncertain length of time, which may last for life.
Freeman, Douglas Southall (born 1886), editor and author, born Lynchburg, Va.; editor *Richmond News Leader* after 1915; professor of journalism Columbia University after 1934; Pulitzer prize (1935) for biography 'R. E. Lee'; other works, 'The Last Parade', 'The South to Posterity'.
Freeman, Edward Augustus (1823-93), English historian, very careful and unbiased but wordy ('History of the Norman Conquest') quoted G-172, H-296
Freeman, Mary Eleanor Wilkins (1862-1930), American short-story writer and novelist, born Randolph, Mass.; at her best in portraying repressed lives of New Englanders ('A Humble Romance' and 'A New England Nun', short stories; 'Jane Field' and 'Pembroke', novels; 'The Wind in the Rose-Bush', ghost story; 'The Long Arm', detective story).
Freeman, in American colonies A-166
Freeman's Farm, battles of, fought Sept. 19 and Oct. 7, 1777, near villages of Stillwater and Bemis Heights, N.Y. (about 10 mi. s.e. of Saratoga Springs); also called battles of Saratoga because English surrendered to Americans at Saratoga, near present Saratoga Springs: S-28
Freemasons, secret fraternity F-193
memorial to Washington V-307

Free Methodist church, developed from the Methodist Episcopal church; organized 1860 at Pekin, N.Y., to bring about a return to Methodism as originated by Wesley; adopted doctrine of Methodist Episcopal church with added belief in entire sanctification (freedom from inward sin) and in a stricter view regarding general judgment and future reward and punishment; membership in U.S. 38,000.
Freeport, Ill., city in n.w., 105 mi. n.w. of Chicago; pop. 22,366; varied manufactures including electric dry cell batteries, cheese, toys: *map* I-13
Lincoln-Douglas debate L-145
Freeport, N.Y., residential suburb of New York City on s. shore of Long Island; pop. 20,410.
Freeport Doctrine L-145, 144
Free ports T-13b
inland nations, importance to H-214
Freer, Charles L. (1856-1919), art collector and financier, born Kingston, N.Y.; Freer Gallery of Art, Washington, D.C. (gift to nation), *table* M-392
Freesia, a genus of plants of the iris family with narrow ribbon-like leaves and showy fragrant white, pale yellow, pink, or purplish flowers; native to S. Africa; few species grown in greenhouses.
Free silver. See in Index Silver, free coinage of
Free-Soil party, in U.S. P-292
Freetown, capital of Sierra Leone, and one of best seaports in Africa; on w. coast about 500 mi. s.e. of Dakar; pop. 55,000; naval coaling station; exports rubber, palm oil, gums, nuts, ginger: *map* A-42a
Free trade T-13-13a, 13b
England E-273, 276a
Free verse (French *vers libre*), an unrhymed, unmetrical verse form; secures a variety of rhythmic effects by use of cadence; unit of rhythm is the stanza or strophe; form found in 'Psalms', 'Songs of Solomon'; in poetry of Matthew Arnold, Walt Whitman, Amy Lowell, Carl Sandburg, and others
Whitman W-95: quoted P-271
Free wheeling B-107
Freezing F-193-4, W-43, P-194
food preservation R-68, V-311b
freezing points, table F-194
frostbite treatment F-66
"Freezing," in business and finance commodities and prices N-12p-q
jobs N-12r
Freiberg (*fr'ibérk*), Germany, mining town in Saxony, 25 mi. s.w. of Dresden; pop. 35,000; famous mining academy; silver and lead.
Freiburg (*fr'ibúrk*), Germany, city in Baden, 72 mi. s.w. of Karlsruhe; noted for university (founded 1457) and fine Gothic cathedral; trading center of Black Forest; battleground during Thirty Years' War; pop. 90,000; called Freiburg im Breisgau, from old district of Breisgau of which it was capital
gild house, picture G-87
Freight R-45. *See also in Index* Pack transportation
ancient and medieval methods of transporting C-101, R-76
car ferry: Lake Michigan M-155
motor truck A-388
rates R-45: Interstate Commerce Commission regulates I-112; marine C-323; rebate system forbidden R-122
trains R-40: freight classification yard, *picture* R-42; routing and switching R-44-5; speed R-44-5; tonnage freight R-45

tunnels: Chicago C-189
vessels S-128, C-323; Great Lakes, pictures G-148, S-330b; Mississippi barges, picture M-193
wagon hauling, picture P-221j
wharf facilities, pictures N-100, H-215, 216, 217
yards R-44-5, picture R-42
Freiligrath (*fr'lik-rät*), Ferdinand (1810-76), German poet; wrote political and lyric verse; translated English, French, and American classics into German.
Freistaat Bayern (*fr'shtät bi'ern*), German name for Bavaria.
Frelinghuysen (*fr'ling-hi-sen*), Theodore (1787-1862), lawyer, statesman, and educator, born Millstone, N. J.; U. S. senator 1829-35; defeated for vice-president P-296
Fremantle, Western Australia, port of Perth, 12 miles distant; at mouth of Swan River; railroad terminus; shipbuilding; manufactures of iron and steel, furniture, flour, soap; pop. 25,000; map A-372a
Frémiet (*främ-yä*), Emmanuel (1824-1910), French sculptor noted for animal studies.
Fre'mont, John Charles (1813-90), American general and explorer; born Savannah, Ga.; led expedition 1842 that showed practicability of a route over Rocky Mts.; made first scientific exploration of Pacific coast: F-16-17, C-34
commanded western department Civil War C-253
conquest of California C-33
explorations N-79-80: Wyoming W-196
Kit Carson and C-88
Fremont, Neb., city 30 mi. n.w. of Omaha; pop. 11,862; trading center; dairying and live stock interests; Midland College: map N-57
Fremont, Ohio, city 30 mi. s.e. of Toledo on Sandusky River; pop. 14,710; cutlery, dry cells, castings, dyes, beet-sugar; home of President Hayes.
Fremont Peak, in Wind River Mts., Wyoming (13,730 ft.).
Fremstad (*frém'stät*), Olive (born 1870), American operatic soprano and lieder singer; born Sweden; noted for Wagnerian rôles ('Isolde'; 'Brunnhilde'; 'Kundry').
French, Alice. See Thanet, Octave
French, Allen (born 1870), American author, born Boston, Mass.; writer of stories of history and mythology for young folks; especially noted for Revolutionary War stories ('Heroes of Iceland'; 'The Story of Rolf and the Viking's Bow'; 'The Siege of Boston').
French, Daniel Chester (1850-1931), American sculptor, born Exeter, N. H.; received most of art training in America; called "the typical American sculptor"; given commission for 'The Minute Man' at Concord, Mass., at 23; encouraged by Louisa M. Alcott; made two noted statues of Lincoln: S-62
'Minute Man' L-100, picture S-63
French, Sir George Arthur (1841-1921), Canadian soldier, born Roscommon, Ireland; 1873 organized the Northwest Mounted Police.
French, John D. P., Earl of Ypres (1852-1925), British field marshal; commander of British forces in Belgium and France 1914-15; commander in chief of forces in the United Kingdom 1915-18; lord lieutenant of Ireland 1918-21 at first battle of Marne M-67
French, William V-288
French Academy A-4

French and Indian War (1754-63), North American phase of Seven Years' War in Europe F-194, A-162
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colonists lack unity R-81
effect on Spain S-222-3
Indian tribes involved I-68, 54
Louisburg taken N-180, W-129
Montcalm leads French M-246
results F-194, R-82, S-222-3, map A-161
Treaty of Paris ends S-84
Washington in W-15
Wolfe W-129
French Broad River, rises in Blue Ridge of w. North Carolina, and flows w. 250 mi. to the Holston River in Tennessee: map T-46
French bulldog D-82
French-Canadians C-56
Quebec Q-3, 4: peasants revolt Q-5, P-61
W. H. Drummond's poems D-114-5
French chalk, a variety of steatite talc; used to remove grease spots and by tailors to mark cloth.
French Committee of National Liberation W-179g
French Congo, Africa. See in Index
French Equatorial Africa (French Congo), French colonial territory in w. cent. Africa; includes the colonies of Gabon, Middle Congo, Oubangi Chari, and Tchad; 960,000 sq. mi.; pop. 3,425,000; cabinet woods, palm oil, rubber, ivory; cap. Brazzaville: maps A-42a, b
French Foreign Legion. See in Index
French Guiana (*gë-ä'nä*), French colony on n.e. coast of South America; 34,750 sq. mi.; pop. 37,000; cap. Cayenne: G-183, maps S-208b, d
French Guinea (*gün'e*), colony forming part of French West Africa, on coast between Portuguese Guinea and British colony of Sierra Leone; about 96,911 sq. mi.; pop. 2,010,000; cap. Conakry: map A-42a
French harp, harmonica, or mouth organ H-224-5
French horn, a musical instrument H-339, M-323
range of, picture S-198
French in America
colonial possessions A-156, A-161-2
discovery and exploration A-145-6, C-59, pictures C-61, I-14
Champlain C-138, pictures C-64, A-159
Hennepin H-274
LaSalle and Tonty L-66, L-208, I-13, I-50
Marquette and Joliet M-67, J-226
Nicolet W-122, W-126, M-154
Wisconsin region W-126
fur trade F-223-6
Huguenots: in Florida F-110, C-300
later Huguenots A-160, 161
Louisiana L-207, 208: included Illinois I-18; Indiana I-50; Mississippi M-202; Missouri M-209
New France Q-5, A-162: included Maine M-40; Michigan M-154; Minnesota M-194; Vermont V-287
wars A-161-2
French India, widely separated French dependencies in India (Pondicherry, Karikal, Chandernagor, Mahé, and Yanaon); total area 196 sq. mi.; pop. 300,000: map I-31
French Indo-China, French possession in s.e. Asia; about 260,000 sq. mi.; pop. 23,000,000: I-73a-d, maps I-73b, A-332c. See also in Index
Annam; Cambodia; Cochinchina; Laos; Tonkin
Japanese invasion W-178i, s, I-73d

French language F-195-6
alphabet A-134b
beginnings R-128, F-195
Canada C-56
English, influence on E-282
number of people speaking P-172
in Switzerland S-351
Walloon dialect B-90
French Lick Springs, Ind., saline-sulphur springs in s.w. near village of French Lick (pop. 2042), 65 mi. n.e. of Evansville; noted health and pleasure resort: map I-46
French literature F-195-200, Outline L-63. See also in Index names of chief writers
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chief dramatists, list D-98
Corneille defines tragedy C-369-70
Hugo shatters traditions H-353
Molière develops comedy of manners M-217
Racine departs from set rules R-12
early romances R-127: 'Song of Roland' R-126, S-303i
essay of Montaigne E-303, M-242
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French Academy, influence of A-4
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realists and naturalists F-197, D-96
Revolution, effect of F-197
romanticists F-197: Hugo H-353
salons, influence C-347a
French Morocco, or **French zone of Morocco**, French protectorate comprising nearly all Morocco; about 155,000 sq. mi.; pop. 6,300,000; cap. Rabat: M-260, maps A-127, A-42a, b
French philosophers F-173
French pitch, in music S-197
French provincial furniture, picture I-101
French Revolution (1789-95) F-200-4, Outline F-184-5
Austria and Prussia hostile F-202
Bastille falls F-202, picture F-200
calendar changed F-204, W-65, C-23
Carlyle's history of C-84, 85
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English views: Burke B-278; Paine P-12
Estates-General meets F-201, E-305
Europe, effects on E-324, F-181
Jacobin party J-181, F-204
Lafayette's part L-54
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literature influenced F-197
Louis XVI L-202-3
Marat M-59-60
Marie Antoinette M-64
'Marseillaise' N-24: words N-26
Mirabeau M-197
monarchy overthrown F-202
Napoleon and N-5-6
Netherlands N-73
nobles renounce privileges F-202
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Robespierre R-117, F-204
Madame Roland executed R-127
'sans culotte' D-109
serfdom ended S-161
Talleyrand in Directory T-6
'X Y Z' affair with U.S. X-202
French seam, diagram S-91
French Somaliland, also **French Somali Coast**, colony in n.e. Africa bordering Gulf of Aden; about 8400 sq. mi.; pop. 46,000; cap. Djibouti: maps A-42a, E-308

Key—cäpe, ät, fär, fäst, whät, fäll; mä, yët, fërn, thäre; ice, bít; rōw, wón, fôr, nôt, dq; cüre, büt, ryde, full, bärn;

French Sudan, colony in French West Africa, formerly called Upper Senegal-Niger; includes w. part of Sudan; about 591,000 sq. mi.; pop. 3,570,000; cap. Bamako: S-317, map A-42a

Frenchtown, former village on site of present Monroe, Mich., on Raisin River 35 mi. s.w. of Detroit; Americans defeated by British and Indians, 1813, followed by massacre of wounded Americans (Raisin River Massacre).

French West Africa, French dependency in w. Sahara and adjacent coastal regions; cap. Dakar (pop. 45,000); comprises the colonies Mauritania, Senegal, French Guinea, Ivory Coast, French Sudan, Niger, Dahomey, and region around Dakar; total area, about 1,815,000 sq. mi.; pop. 14,700,000: map A-42a-b. See also in Index names of colonies

cotton growing, map C-379

Sahara desert S-4-6

transportation on Niger N-143

village reproduced, picture F-4

French West Indies, collective name for French island colonies of Guadeloupe and Martinique in West Indies: G-181, M-72, map W-72b-c. See also in Index West Indies

Freneau (*frē-nō'*), Philip (1752-1832), early American poet and journalist; edited anti-Federalist *National Gazette*, Philadelphia (1791-93); engaged in heated controversy with Hamilton ('The British Prison Ship'; 'Eutaw Springs'): A-177

Frensen, Gustav (born 1863), German novelist; for several years was a village pastor; later devoted all his time to writing; 'Jörn Uhl' novel of peasant life in northern Germany, made him famous: G-63

Frenulum, on moth wings, color plate B-285a-b

Frequency, in physics, the rate of vibration

alternating current E-230

audio-frequency, in radio R-20, 22-3

electromagnetic radiations R-14

light, table R-14

radio R-20-2, 23: modulation R-28a

radio waves R-17-19, 26, table R-14

sound waves S-195, 196, diagram S-198

television, modulation T-41, 42

Frequency, law of, in learning L-81

Frequency distribution, in statistics G-136f-g, graph G-136g

Frequency modulation (FM)

radio R-28a

television T-41, 42

Frere (*frēr*), Sir (Henry) Bartle (1815-84), English administrator, nephew of John Hookham Frere; governor of Bombay 1862-67; as special commissioner to East Africa influential in abolishing slave trade in Zanzibar; as governor of Cape Colony 1877-80 attempted confederation of South Africa.

Frere, John Hookham (1769-1846), English diplomat and author, minister to Portugal 1800-02, to Spain 1802-04 and 1808; his spirited verse translations of Aristophanes' plays have never been equaled.

Fresco, method of painting on fresh plaster P-15. See also in Index Mural painting

Egyptian, picture P-14

Giotto G-89, 90, picture P-15

Guido Reni, picture A-365

Michelangelo, Sistine Chapel S-139, M-146, 148, picture M-147

Raphael R-50

Vinci, Leonardo da, picture V-299

Frescobaldi (*frēs-kō-bā'ldē*), Girolamo (1583-1644), Italian composer and organist born Ferrara; organist at St. Peter's in Rome 30 years; composed for organ, also for voice.

Fresenius (*frā-zā'nī-ūs*), Karl Remigius (1818-97), German chemist, born at Frankfurt-on-the-Main; founder of chemical laboratory at Wiesbaden Agricultural Institution; author of standard works on analytical chemistry.

Freshman, in college C-301

Fresh-water clam, a mussel C-259

Fresnel (*frā-nēl'*), Augustin Jean (1788-1827), French physicist; demonstrated (after Young but independently) wave theory of light; established mathematical analysis of optical phenomena; contributed theory that light waves are transverse; changed entire world's lighthouse illumination ('Fresnel system'): L-128-9

Fresno, Calif., city 162 mi. s.e. of San Francisco; pop. 60,685; center of dried fruit industry and state's raisin trade; packing and shipping point for fresh fruits; flour and lumber; potteries, foundries; teachers college: C-29, maps C-26, 28

Freud (*froid*), Sigmund (1856-1939), Austrian neurologist and psychiatrist; founder of psychoanalysis, which he made an important tool for diagnosing and relieving emotional conflicts; voluntary exile in London after 1938: P-362

cocaine as anesthetic A-196

Frey (*frā*), in Norse mythology, god of peace, prosperity, and fruitfulness, brother of Freyja.

Freyja (*frā'yā*), Freyia, or Freya, in Norse mythology, goddess of love.

Freytag (*frī'tāk*), Gustav (1816-95), German novelist and playwright; influenced by Scott and Dickens; his novels impressive by their sturdy realism, with strong undercurrent of patriotism

chief works G-64

Friant Dam, in California C-29

Friar M-234

Friars Minor, Order of, part of the First Order of St. Francis (Franciscans), established 1209. Also part of the First Order are Friars Minor Conventuals and Friars Minor Capuchins.

Friar Tuck, vagabond friar in Robin Hood legends; appears in 'Ivanhoe' as the 'holy clerk of Copmanhurst' R-118, picture R-119

Frick, Henry C. (1849-1919), American capitalist and steel manufacturer, born West Overton, Pa.; early obtained control of most of Connelsville coal lands; entered Carnegie Steel Company (1882), becoming rival of Carnegie for control and one of wealthiest men of country, leaving fortune of \$100,000,000; donated Frick Museum to New York City.

Friction, in physics and industry F-204, P-193, 194

alloys reduce A-132

fire started by F-45, pictures F-47, P-193

lubricants reduce L-211

Frictional electricity E-219, 220, 231

Friday, in Defoe's 'Robinson Crusoe', savage rescued from cannibals by Crusoe, later his servant C-407, 408

Friday

Good Friday E-140

Mohammedan Sabbath S-1

origin of name D-21

Fridtjof Nansen (*frēt'yōf nān'sēn*)

Land, U.S.S.R., formerly Franz

Josef Land, Arctic archipelago of about 100 small islands n. of Novaya Zemlya and e. of Svalbard: A-277, map A-332b

Andree at P-282, picture P-286

radio station P-286

Friedland (*frēt'lānt*), Germany, town in East Prussia, on Alle River 27 mi. s.e. of Königsberg; famous as scene of battle between French under Napoleon and Russians (1807): N-8

Ney at N-136

Friedrichshafen (*frē-driks-hā'fēn*), Germany, city on n.e. shore of Lake Constance in province of Württemberg. It has Zeppelin and Dornier airship factories, fine harbor, and bathing beach; pop. 14,000.

Friendly Islands. See in Index Tonga Islands

Friends, religious organization founded in England about 1650 by George Fox; called Quakers, originally in derision; among earliest opponents to human slavery; consider war opposed to the spirit of Christ; refuse to swear oaths; U. S. membership about 95,000. American Friends Service Committee, Inc., formed 1917 especially to relieve suffering in 1st World War. does relief work in any situation of emergency throughout the world; child feeding in warring countries and helping war refugees important part of work

beginnings in America A-151

found Pennsylvania A-151, P-110-11, 116

hats H-236

Indians, relations with P-116, 117

in New Jersey N-91, 92

outgrowth of Puritanism C-233

prison reforms in United States P-350

schools E-176

Sunday observance, in colonial times A-167

Wilmington, Del. W-105

Friendship

boys and girls E-312b

Damon and Pythias D-10

'Friendship', a Little Talk by Arthur Mee F-205

Friends of Irish Freedom, in U.S. H-218

Friends' Public Grammar School, early Pennsylvania school P-116

Friends University, at Wichita, Kan.; opened 1898 (chartered 1891); Society of Friends; liberal arts college, school of music, biblical school.

Fries (*frēs*), John (1764-1825), American insurgent, leader of 'Fries' Rebellion' in Pennsylvania, 1799, revolt against a direct tax levied by Congress: A-14

Frieske, Frederick Carl (1874-1939), American artist, born Owosso, Mich.; an impressionist painter known chiefly for his portrayal of female figures in sunny outdoor settings or in colorful interiors; works are fresh in color, decorative, and highly luminous.

Friesian (*frē'zhān*) Islands. See in Index Frisian Islands

Friesians. See in Index Frisians

Friesland (*frēz'lānd*), n.e. province of Netherlands, surface partly below sea level, protected by dikes; 1249 sq. mi.; pop. 402,000; horses and cattle.

Frietchie, Barbara (1766-1862), heroine of Whittier's poem of same name who is represented as defiantly waving Stars and Stripes from her window as Stonewall Jackson's men marched through

- Frederick, Md., during Civil War. There actually lived in Frederick, a Mrs. Fritchie, who was an outspoken devotee of the Union cause, but the incident narrated in the poem is imaginary.
- Frieze** (*frēz*), in architecture, picture A-259
Parthenon A-11-12, pictures A-352, G-168, E-336, color plate A-260a-b
- Frieze**, a heavy woolen cloth having a nap on the surface; used chiefly for overcoats.
- Frig'ate**, name originally applied to merchant vessels propelled by sails or oars; later to full-rigged, fast war vessels, smaller than ships of the line; carried from 24 to 50 guns; in use from about 1650-1840: picture S-125
- Frigate-bird**, or man-o'-war bird F-206
- Frigga**, or Frigg, in Norse mythology, wife of Odin and goddess of marriage and domestic life; Friday named for her; sometimes confused with Freyja
Balder, son of B-16
- Frigid zones**, or polar zones, of earth C-270a, b, 271, E-133, L-71, diagram E-133
- Frijole** (*frē-hō'lā*), Mexican bean B-65
- Frill-back**, a pigeon P-216
- Frilled lizard** L-170, pictures L-169, 171
- Friml** (*frim'l*), Rudolf (born 1881), pianist and composer, born Prague, Czechoslovakia; was accompanist to Kubelik; located in New York 1906 ('The Firefly', 'Katinka', 'The Vagabond King', light operas).
- Fringed gentian** G-30-1
- Fringetree**, a small tree (*Chionanthus virginica*) of the olive family with fragrant fringe-like white flowers in graceful drooping panicles; ornamental in cultivation.
- Fringillidae** (*frin-gil'i-dē*), the finch family, a large family of seed-eating birds including finches, sparrows, and buntings F-35
- Fringing reefs** C-364
- Frisé** (*frē-zā'*), a pile fabric used for upholstery; designs are produced by contrast of cut and uncut loops, by use of different colored yarns, or by surface printing.
- Frisian** (*frē-zhān*), or Friesian, Islands, chain in North Sea off Dutch coast; from Zuider Zee e. and n. as far as Jutland; 400 sq. mi.: map B-87
Helgoland H-271
- Frisians**, or Friesians, a w. Germanic seafaring people who in first century A.D. were found by the Romans in occupation of the coastland from the Rhine to the Ems River; gradually conquered by the Franks and put under Frankish rule in 9th century; maintained independence from 13th to 18th centuries when province of Friesland became part of Holland.
- Fritchie**, Barbara Hauer, real name of Whittier's heroine. See Fritchie
- Fritillaries**, or silverspots, butterflies of the genus *Argynnis* and related genera
Diana, color plate B-283a-b
- Froben** (*frō'bū*), or Frobenius, Johann (1460?-1527), German printer and scholar; printed works of Erasmus. many editions of the Latin Bible and other fine works: B-190
- Frobisher** (*frōb'ish-ēr*), Joseph (died 1810), Canadian fur trader, born Halifax, England; came to Canada 1769; engaged in fur trade on Churchill River at Frog Portage; became partner in North-West Company; 1792-96 represented Montreal in Legislative Assembly of Lower Canada.
- Frobisher**, Sir Martin (1535?-94), British navigator and naval hero, first to seek the Northwest Passage; made three voyages to Labrador: P-280
gold discoveries A-145
- Frobisher Bay**, inlet of Davis Strait opening westward at s. end of Baffin Land
discovery P-280
- Fröbel** (*frō'bēl*), Friedrich Wilhelm (1782-1852), German educator, founder of kindergarten F-206, K-17
- Frog** F-207-9, pictures F-207, 208, N-31, H-288
classified B-116
eggs, pictures F-208, E-193
eye, picture E-351
foot F-208, picture F-147
hibernation H-288, F-208
kinds F-209
length of life F-208
metamorphosis F-207-8, pictures F-208
toad differentiated from T-100
warts not caused by W-11
- Frogbait**, a water plant, picture P-239
- Frog-fish** F-72-3
guards eggs F-71
- Froghopper**, a leaping insect of the family *Cercopidae*; the young void a white frothy substance over themselves which serves as a protective covering during their growth; also called spittle bug and frothfly.
- Frogmore**, royal mansion one mi. s.e. of Windsor Castle W-114
- Frog shell**, picture S-109
- Frohman** (*frō'mān*), Charles (1860-1915), American theatrical manager, born Sandusky, O., of Jewish parents; brought out Maude Adams, John Drew, Julia Marlowe; died on *Lusitania*.
- Frohman**, Daniel (1851-1940), American theatrical manager, brother of Charles, born Sandusky, O.; author of 'Memories of a Manager'; 'Daniel Frohman Presents'.
- Froissart** (*frō'wā-sār*), Jean (1337-1410?), French chronicler and poet F-209, F-196
battle of Crécy described by H-357
- 'Frolie'** and the **'Wasp'**, battle of, sea fight in War of 1812, between the sloops *Wasp* (American) and *Frolie* (British), October, 1812; marked by terrific fighting in high sea; *Wasp* took *Frolie* but was captured herself almost immediately by a British frigate.
- Frölich** (*frō'lik*), Theodor Christian Brun (born 1870), Norwegian physician, professor of medicine at Royal Frederick University, Oslo
experiments with scurvy V-311b
- Fromentin** (*frō-mān-tān*), Eugène (1820-76), French painter and author; best known for paintings of north Africa; wrote and illustrated book on Sahara Desert; also wrote a novel ('Dominique') and a work on Dutch and Flemish painting.
- Frome River**, in England, flowing 20 mi. into the Avon; Bristol is located at its junction with the Avon River.
- Fronde**, leaf of fern F-24, 26
- Fronde** (*frōnd*), The, a civil war in France during minority of Louis XIV (1649-52) and the consequent war with Spain (1653-59), so called (*fronde*, "sling") from free use of slingshots by the Paris mob; its suppression contributed to the growth of absolutism under Louis. Also name of the political party that opposed the King.
- Frontal bone**, the bone forming the forehead or front of the cranium S-156, picture S-156
- Frontal lobe**, of brain B-221, picture B-220
- Frontenac** (*frōn'tū-nāk*), Count Louis de (1620-98), governor of New France F-209
fort at Kingston K-23
Joliet and J-226
LaSalle and L-66, 67
- Frontenac**, Château, hotel in Quebec, pictures Q-7, C-60
- Frontera** (Spanish for "frontier"), in Chile C-207d
- "Front Gate,"** of Peking, picture P-101
- Frontier**, in America. See in Index Far West; Pioneer life
- Frontier Day**, Cheyenne celebration C-238, W-194
- Front Range Mountains**, Colo., most easterly range of Rockies; contains Pikes Peak and Longs Peak.
- Front Royal**, Va., town, cap. of Warren County, 105 mi. n.w. of Richmond; pop. 3831; "Stonewall" Jackson defeated Colonel Kenly, May 1862.
- Frost**, Arthur B. (1851-1928), American illustrator and author, born Philadelphia ('Bull Calf and Other Tales', 'Carlo')
'Uncle Remus' illustrations L-157, pictures L-114
- Frost**, Edwin Brant (1866-1935), American astronomer, born Brattleboro, Vt.; studied in Germany and United States; professor astronomy and director observatory, Dartmouth; professor astrophysics University of Chicago and director Yerkes Observatory; important work in stellar spectroscopy; became blind in later years but continued work ('Let's Look at the Stars').
- Frost**, Frances (born 1905), writer, born St. Albans, Vt.; instructor creative writing University of Vermont 1929-31. Poems ('These Acres', 'Pool in the Meadow') show good lyric qualities. Novels include 'Innocent Summer', 'Yoke of Stars'.
- Frost**, Robert (born 1875), American poet; born San Francisco, but has lived chiefly in New England where he was a farmer for several years; poet in residence 1921-23, and Fellow in Letters 1925-26, at University of Michigan; professor at Amherst College 1923-25 and 1926-38; selected for Ralph Waldo Emerson chair of poetry at Harvard University 1939; won Pulitzer prize 1924, and 1931; excels in affectionate rendering of the spare, austere New England spirit ('A Boy's Will'; 'North of Boston'; 'New Hampshire'; 'West-running Brook'); A-182, picture A-181
quoted P-270
- Frost** F-209-10
crop protection F-210, F-214, O-238
- Frost bites**, treatment of F-66
- Frosted glass** G-104
- Froth flotation process** M-122
- Frothfly**. See in Index Froghopper
- Froude** (*frōd*), James Anthony (1818-94), English historian, often prejudiced but a master of style ('History of England from the Fall of Wolsey to the Defeat of the Spanish Armada'; 'Reminiscences of Thomas Carlyle'; biographies of Julius Caesar and Disraeli).

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; ice, bīt; rōw, wōn, fōr, nōt, dō; cūre, bāt, rȳde, fȳll, bārñ;

Frozen assets B-43

Fructose, levulose, or fruit sugar, a simple (monosaccharide) sugar ($C_6H_{12}O_6$), one and three-fourths times as sweet as cane sugar; also called levulose; differs from glucose in structure of molecule: S-322
 artichokes contain A-316
 fermentation Y-205
 polariscope test L-131

Fruit, in botany, the matured seed-container of a flowering plant F-214
 classification F-214
 dispersal S-73-5, W-48-9

Fruit and fruit growing F-211-14. *See also in Index* names of fruits, as Apple; Orange, etc.
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blight B-156

cicada C-235

citrus canker G-134

fungi: blight B-156; mildews and molds M-169-70

grape phylloxera G-135

mealy bugs I-90

Mediterranean fruit-fly I-90, F-129

moths B-286, C-294, I-89

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scale insects S-34-5

weevils W-65

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history of F-211-12

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Crusaders bring new varieties to Europe C-406

grape culture G-135-6

importing new varieties to America A-56: apple A-231; cherry C-182;

grapefruit G-134; melons M-112;

orange O-238; pear P-95; plum P-260

improvement and new varieties

F-211: Burbank's experiments

B-276-7. *See also in Index*

Plant improvement

orchard management F-212-14

cover-crop F-213

electric power equipment A-51

frost protection O-238, F-214

grafting F-211, G-136, *pictures*

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picking and marketing F-212-13

pruning F-214, G-136, *picture* F-212

sorting and packing: automatic

A-384; oranges, *picture* O-239;

prunes P-358

sprays and spraying S-262-3

tree surgery T-137

pollination. *See in Index* Pollen and

pollination

rare tropical fruits F-212

seedless varieties: orange O-238;

pineapple P-221

stone-fruits, origin A-332

United States industry U-192, F-213:

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Michigan M-152; rare tropical

fruits F-212; Vermont V-287;

West Virginia W-76

Fruit flies F-129

"Fruit Sale," game P-253, *picture*

P-253

Fruit sugar. *See in Index* Fructose

Fru'menty, an old breakfast dish

B-233

Frunze (*frun'zē*), Russia, industrial

city about 200 mi. s. of Lake Balk-

hash; capital of Kirghiz Soviet

Socialist Republic; pop. 93,000:

map A-332b

Frustules (*früs'tülz*), of diatoms D-64

Frustum, of a pyramid or cone M-117,

diagram G-49

Fry, Elizabeth Gurney (1780-1845),

English Quakeress, prison reformer
 P-350

Fry, Roger E. (1866-1934), English painter and art critic; paintings show fine sense of form and design; published works include 'Vision and Design' and 'Architectural Heresies of a Painter'; ultra-modern tendencies
 quoted P-24

Fry'att, Charles (1872-1916), English captain of a British merchant ship which rammed and sank a German submarine; court-martialed and shot by Germany.

Frye, William Pierce (1831-1911), American legislator, born Lewiston, Me.; attorney-general of Maine, 1867-69; representative in Congress, 1871-81; senator, 1881 until death; member of Peace Commission at Paris in 1898; as chairman of commerce committee influenced American shipping legislation.

FSA (Farm Security Administration)

R-146g, U-228

health insurance S-179

FSA (Federal Security Agency)

R-146g, U-231-2

FSCC (Federal Surplus Commodities Corporation) R-146g

Fuad (*fū'ād*) I, Ahmed Ali Pasha (1868-1936), king of Egypt; became sultan 1917, proclaimed king 1922, upon removal of British protectorate: E-201

Fuca (*fū'kā*), Juan de (died 1602), Greek navigator whose real name was Apostolos Valerianos; served in Spanish navy; explored n.w. coast of North America
 Puget Sound explored O-246

Fuchow, China. *See in Index* Foo-

chow

Fuchsia (*fū'shā*), an ornamental plant F-215

"Fudge box," in newspaper N-106

Fuehrer, or Führer, Der (*dēr fū'rēr*), head of German fascist (Nazi) government F-18

Hitler H-311

Fuel Administration, U.S., in first

World War W-170

poster, *picture* W-171

Fuel foods, values F-144-5, H-372,

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Fuel oils, certain petroleum products

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Fuels F-215-17. *See also in Index*

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British thermal unit H-262

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coal C-283-8

coal-tar pitch C-289

coke C-298

combustion F-45-6

gas G-22-4, H-261

gasoline P-149-50

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heat energy and mechanical work

P-194, H-263

lignite C-284, N-161-2, T-54

manure, or dung A-239, B-150, B-169,

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measurement of heat H-262: calorie

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mesquite used for M-121

national power and F-216

peat P-98-9, C-283, F-215

petroleum P-144-153: locomotives

burn L-178; ships S-124, N-55

physics of heat P-194, H-259-63

plants used for P-245

production, consumption and trade of

world, *pictographs* M-188a, b

smoke S-165-6

source of industrial power C-288

sugar stalks, or bagasse S-320

supplies, U.S. U-194

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wood F-215, C-46-7, A-171

work obtained P-194

yareta, Bolivian wood B-169

Fuel values, of food F-144-5, H-372,

chart F-144b

Fuenterrabia (*fūēn-tēr-rā-bē'ā*),

or Fontarabia, Spain, town on

French frontier, on river Bidassoa;

famous fortress destroyed by

French 1794; Wellington crossed

Bidassoa near here in 1813 in spite

of French opposition.

Fuerte (*fūēr'tā*), river in w. Mexico;

180 mi. to Gulf of California: *map*

M-133

Fuertes (*fūēr'tās*), Louis Agassiz

(1874-1927), American painter and

naturalist, born Ithaca, N.Y.; cele-

brated for his paintings of birds,

which are accurate and realistic.

Fugger (*fū'gēr*), wealthy family of

German merchants and bankers,

famous in 16th century; founded

by Johann Fugger, Bavarian weav-

er in 14th century

Charles V and G-68

Fugitive slave laws, U.S. laws, passed

in 1793 and 1850, which provided

for the return of escaped Negro

slaves from one state or territory to

another state

Compromise of 1850 C-250

Dred Scott Decision D-103

Fillmore and F-34

Wendell Phillips attacks, *picture*

U-245

Fugue (*fū'g*), in music M-312

Fujiyama (*fū-jē-yū' mā*), also Fuji-

San, sacred mountain of Japan, 70

mi. s.w. of Tokyo; about 12,500 ft.

high: *map* J-186, *picture* J-186c

Fukien (*fū'ki-ēn*), China, maritime

province in s.e.; 61,275 sq. mi.;

pop. 11,755,000: *map* C-212

Foochow, capital F-139

Fula, or Fulbe, a numerous and power-

ful African people scattered over

a wide area from near w. coast to

Anglo-Egyptian Sudan; have well-

marked features and are light in

color; probably Berber in origin

with some Negro blood; chiefly a

wandering pastoral people; religion,

Mohammedan.

Ful'gurites (from Latin *fulgur*, light-

ning), tubes in sand or rock made

by lightning passing through these

materials and fusing them; also

rocks that have been fused on the

surface by lightning.

Fuller, Ben Hebard (1870-1937),

major general, head of U.S. Marine

Corps (appointed 1930), born Big

Rapids, Mich.; joined Marine Corps,

1891, as second lieutenant, served

in Spanish-American War; with

marines in Philippines, 1899-1901,

in Santo Domingo, 1918-19, and in

Haiti, 1924-25.

Fuller, George (1822-84), American

painter, poetic dreamer and ideal-

ist, born Deerfield, Mass. ('The

Romany Girl'; 'The Turkey Pas-

ture').

Fuller, Henry Blake (1857-1929), American

novelist and literary critic,

born Chicago; work shows charm

and grace of style, good taste, and

ü=French u, German ü; gern, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); κ=German guttural ch

- wide knowledge of literature; 'The Chevallier of Pensieri-Vani' and 'Gardens of this World' are stories of travel in Europe; 'The Cliff-Dwellers' is about life in Chicago.
- Fuller, Loie (1862-1928), American actress and dancer, born near Chicago; originated serpentine dance; wrote 'Fifteen Years of a Dancer's Life'.
- Fuller, Margaret (Marchioness Ossoli) (1810-50), American writer, born Cambridgeport, Mass.; brilliant and advanced in thought; remembered chiefly for her association with the Transcendentalists and Emerson; first editor of the *Dial*; married in Italy; entered the struggle for Italian independence; drowned at sea ('Woman in the Nineteenth Century'; 'Papers on Literature and Art').
- Fuller, Melville Weston (1833-1910), American jurist, born Augusta, Me.; chief justice U. S. Supreme Court 1888-1910; decisions aided growth of federal power.
- Fuller, Meta Warrick (born 1877), American Negro sculptor, born Philadelphia, Pa.; won early recognition at Paris salons; excelled in depiction of horrors, in portraits, and in Afro-American types: S-64
- Fuller, Thomas (1608-61), English clergyman and writer; style vigorous and full of humor; chaplain to Charles II ('History of the Worthies of England') quoted S-96
- Fuller, Thomas (1823-99), Canadian architect, born in England N.Y. capitol, picture N-116
- Fuller's earth, a clay-like substance used in cleansing cloth and wool of grease, and in clarifying oil F-217 variety of Kaolin M-184
- Fullers teasel, a plant used for "fulling" cloth: T-81-2, picture T-81
- Fullerton, Calif., city 23 mi. s.e. of Los Angeles; pop. 10,442; citrus fruits, walnuts; plate glass, refrigeration machinery, canned fruits and juices.
- Fulling, or milling, a process in the manufacture of woolen cloth W-145
- teasel plant used T-81-2, picture T-81
- Full moon M-250
- Full nelson, in wrestling W-182-3, picture W-182
- "Full round," in sculpture S-52
- Fulmar, a gull-like bird belonging with the petrels to the family *Procellariidae*; plumage white, except for gray back and tail; bill stout and hooked; ranges over North Atlantic, wintering south to Georges Bank off Massachusetts.
- Fulminate, a highly explosive salt of fulminic acid (CNOH), used as primer to set off explosive; also other substances which explode at a blow: F-50
- mercury E-347, 348
- silver S-152
- stibnite M-182
- Ful'ton, Robert (1765-1815), American inventor of steamboat F-217
- Cartwright aided in steamboat problems C-90
- invents submarine S-314
- Fulton, N.Y., industrial city 24 mi. n.w. of Syracuse on Oswego River and Canal; pop. 13,362; paper, paper containers, candy, woolen goods.
- Fumarole (fū'mā-rōl), a small earth opening which ejects volcanic vapors
- Alaska A-101: Katmai National Monument N-22a-b, picture N-18
- utilizing for power A-226, V-334
- Yellowstone National Park, picture N-17
- Fumiga'tion A-223
- destroys insect pests I-90, S-263, picture E-145e
- formaldehyde F-159-60
- sulphur dioxide S-324
- Fu'mitory family, or Fumariaceae (fū-mā-ri-ā'sē-ē), a family of plants including the bleeding-heart, squirrel corn, Dutchmans-breeches, mountain fringe, golden-eardrops, and corydalis.
- Funchal (fŭn-chāl'), capital of Madeira; pop. 31,000; picturesque and well built, with narrow steep streets; sugar plantations and vineyards: M-18
- Function, in mathematics, a quantity which depends upon or is determined by another quantity called a variable. For example, the volume of a cube depends upon the length of any edge and therefore is the function of the edge
- trigonometry T-139, table T-140
- Functionalism, in architecture A-274, pictures A-272b
- Fundamen'tal, in music S-197, 198
- Fundamentalism, religious movement in Protestant churches in United States which caused much conflict; term refers to "fundamentals" which adherents believed were necessary to Christian religion, such as literal interpretation of Bible.
- Fundamental Orders of Connecticut, first written constitution H-233, C-340
- Fun'dy, Bay of, large inlet of Atlantic between New Brunswick and Nova Scotia, map C-50c
- high tides T-91, picture T-92: dikes N-180
- Fū'nen, also Fyn, largest of Danish islands after Zealand; 1149 sq. mi.; pop. 320,000; with adjacent islands forms province of Fünen; cap. Odense: D-52, map D-53
- Funeral customs and rites. See in Index Burial and funeral customs
- 'Funeral March', by Chopin M-314
- Fünfkirchen (fünf'kirk-ēn), Hungary. See in Index Pécs
- Fungi (fūn'gi), primitive plants without chlorophyll F-218. See also in Index kinds of fungi listed below
- bacteria B-12-13
- blueberries need B-159
- classification of, Outline B-205
- harmful to plants F-245c; cotton C-380; hollyhock H-324; trees T-137
- mildews and molds M-169-70
- mushrooms M-306-7
- parasites and saprophytes distinguished F-218
- rusts and smuts R-199-201
- slime molds S-163
- spraying kills S-262-3, G-11
- symbiosis (lichens) L-122, P-70
- yeasts Y-204
- Fun'gicides S-262-3
- lignin or sulphite pitch P-61

PRINCIPAL FURS OF THE WORLD

| NAME OR TRADE NAME | ANIMAL GROUP | SOURCE |
|------------------------------------------------------------------|----------------|-------------------------------------|
| Alpaca | Camel | Chile, Peru, Bolivia |
| American Lion. See Puma | | |
| Astrakhan. See Caracul | Weasel Bear | North America, Europe, China, Japan |
| Badger | | |
| Bear | | |
| Black | | |
| Brown | Beaver | North America |
| Grizzly | | |
| White, or Polar | Sheep | North America, Europe, Asia |
| Beaver | | |
| Black Marten. See Skunk | Cat | Western North America, Siberia |
| Broadtail. See Persian Lamb | | |
| California Mink. See Cat | Chinchilla | Arctic regions |
| Canadian Marten. See Fisher | | |
| Caracul (also known as Astrakhan) | Squirrel | Throughout North Temperate Zone |
| Cat—domestic (trade names California Mink, Linette) | | |
| China Bear. See Goat | Raccoon-Weasel | U. S., Northern Europe, Siberia |
| Chinchilla | | |
| Chinchilla Squirrel. See Squirrel | Raccoon | North America |
| Chinese Lynx. See Goat | | |
| Chipmunk | Rodent | Brazil, Argentina, Chile |
| Civet Cat | | |
| Coati | Dog | Mongolia China |
| Cony. See Rabbit | | |
| Cougar. See Puma | | |
| Coyote. See Wolf | | |
| Coypu (trade names Nutria, Nutria Beaver, South American Beaver) | | |
| Desert Cat. See Lynx | | |
| Dogskin—Chinese | | |

Key—cāpe, āt, fūr, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wón, fōr, nōt, dē; cūre, būt, rēde, fūll, bārn;

Fact-Index

PRINCIPAL FURS OF THE WORLD—Continued

| NAME OR TRADE NAME | ANIMAL GROUP | SOURCE |
|------------------------------------------------------------------------------------------------|-------------------------|-----------------------------------------------------------------|
| Ermine | Weasel | Canada, Alaska, Siberia |
| Fisher (trade name Canadian Marten) | Weasel | Canada |
| Fitch, or Polecat | Weasel | Europe, Siberia |
| Florida Mink. <i>See</i> Marmot | | |
| Flying Fox. <i>See</i> Squirrel | | |
| Fox | Fox | |
| Afghan | | Asia |
| Arctic (Blue Fox and White Fox) | | Alaska, Northern Canada, Greenland, Siberia |
| Cross | | Labrador, Hudson Bay, Northwestern U. S. |
| Gray | | U. S., South America |
| Kit | | North America, Asia |
| Red (trade names Sable Fox, Sitka Fox, Sitka Silver Fox) | | Northern U. S., Canada, Alaska, Europe, Asia, Australia |
| Silver | | Northern U. S., Canada, Alaska, Siberia |
| French Chinchilla. <i>See</i> Hare | | |
| French Leopard. <i>See</i> Hare | | |
| French Wolf. <i>See</i> Goat | | |
| Fur Seal (also known as Alaskan Seal, Victorian Seal, Japanese Seal, Shetland Seal, Cape Seal) | Sea Bear | Bering Sea, Cape Horn, Shetland Islands, region |
| Genet | Genet | Hungary, France, Spain, Africa |
| Goat (trade names China Bear, Chinese Lynx, French Wolf) | Goat | Northern China, Russia |
| Guanaco | Camel | South America |
| Hair Fox. <i>See</i> Hare | | |
| Hair Sable. <i>See</i> Hare | | |
| Hair Seal (also known as Tropical Seal, Ribbon Seal, Harp Seal, Hood Seal) | Phocidae (Earless Seal) | Greenland, Labrador, Newfoundland |
| Hare (trade names French Chinchilla, French Leopard, Hair Fox, Hair Sable) | Hare | Russia, Siberia, Arctic regions, Europe, New Zealand, Australia |
| Hudson Bay Sable. <i>See</i> Skunk | | |
| Hudsonia. <i>See</i> Muskrat | | |
| Hudson Seal. <i>See</i> Muskrat | | |
| Iceland Lamb (trade name Iceland Fox) | Sheep | Iceland |
| Kid Skin (trade name Kid Caracul) | Goat | China, Asia Minor |
| Kolinsky (trade names Red Sable, Siberian Mink) | Weasel | Siberia, China |
| Krimmer | Sheep | Crimean Peninsula |
| Lemming | Rodent | Northern Europe |
| Leopard, or Panther | Cat | Africa, Asia |
| Leopard Cat. <i>See</i> Ocelot | | |
| Linette. <i>See</i> Cat | | |
| Llama (trade names Wolf and Fox) | Camel | South America |
| Loutrine. <i>See</i> Muskrat | | |
| Lynx | Cat | Northern North America, Europe |
| Bay (also known as Desert Cat, Wild Cat) | | |
| Canadian | | Canada |
| Marmot (trade names Florida Mink, Maroon, Mar-Konie, Marmink) | Marmot | Europe, Siberia, China, North America |
| Marten | Weasel | |
| Baum | | Northern Europe and Asia |
| Japanese | | Japan |
| Stone | | Europe and Central Asia |
| Mink | Weasel | North America, Europe, China, Japan |
| Mole | Mole | British Isles, Europe, North America, Africa |
| Monkey | Monkey | Africa, Asia |
| Mountain Lion. <i>See</i> Puma | | |
| Muskrat (trade names Hudson Seal, Hudsonia, Loutrine, River Mink, River Sable) | Rodent | U. S., Canada, Russia |
| Nutria. <i>See</i> Coypu | | |
| Ocelot (also known as Leopard Cat and Panther Cat) | Cat | South America, Central America, Mexico |
| Opossum | Opossum | |
| American (trade name Russian Marten) | | U. S. |
| Australian | | Australia |
| Ring-tailed | | Australia |
| Otter | Weasel | Europe, Asia, North and South America |
| Panther. <i>See</i> Leopard | | |
| Panther Cat. <i>See</i> Ocelot | | |
| Persian Lamb (when newborn called Broadtail) | Sheep | Central Asia |
| Polecat. <i>See</i> Fitch | | |
| Pony, Russian | Horse | Russia, Siberia, Central Asia |
| Puma (Cougar, American Lion, Mountain Lion) | Cat | North, Central, and South America |
| Rabbit (Cony and many other trade names) | Hare | Australia, New Zealand, Europe, North America |
| Raccoon | Raccoon | North America, Mexico |
| Red Sable. <i>See</i> Kolinsky | | |
| River Mink. <i>See</i> Muskrat | | |
| River Sable. <i>See</i> Muskrat | | |
| Russian Marten. <i>See</i> Opossum | | |
| Sabeline. <i>See</i> Squirrel | | |
| Sable | Weasel | Northern Asia, Russia |
| Seal. <i>See</i> Fur Seal and Hair Seal | | |
| Siberian Mink. <i>See</i> Kolinsky | | |
| Skunk (trade names Black Marten, Hudson Bay Sable) | Weasel | Canada, U. S. |
| South American Beaver. <i>See</i> Coypu | | |
| Squirrel (trade names Chinchilla Squirrel, Flying Fox, Sabeline) | Squirrel | Europe, Canada, Asia |
| Tiger | Cat | India, Turkestan, China, Mongolia, East Indies |
| Wallaby | Kangaroo | Australia |
| Wild Cat. <i>See</i> Lynx | | |
| Wolf | Dog | |
| Canadian | | Canada |
| Coyote, or Prairie | | Western U. S. |
| Russian, Black, or Siberian | | Russia |
| Timber, or Gray | | North America |
| Wolverine | Weasel | Northern North America, Siberia, Scandinavia |

Fungus gnat, minute fly of the family *Mycetophilidae*; larvae feed on fungus and decaying vegetation.

Funk, Casimir, or Kazimierz (born 1884), Polish chemist, pioneer in vitamin research V-311b-12

Funk, Isaac K. (1839-1912), American Lutheran clergyman, publisher, editor; edited *Literary Digest* and 'Standard Dictionary'.

Funkia (*fūng'kī-ā*). See in *Index* Hosta

Funny bone, nerve at the elbow; pressure or blow on this nerve causes sharp pain to pass along the arm to the fingers.

Fun'ston, Frederick (1865-1917), American general, born New Carlisle, Ohio; captured Aguinaldo 1901; administered martial law in San Francisco during the earthquake and fire 1906; commanded American forces in Vera Cruz 1914.

Fur. See in *Index* Furs and fur trade

Fur farming. See in *Index* Furs and fur trade

Fur, *fūrol*, or *furfural*, an inflammable oily liquid made by distilling wood, sugar, bran, corn cobs, oat hulls, or straw, etc., with sulphuric acid; used in manufacture of lacquers, dyes, resins, disinfectants, and photographic plates, and as motor fuel

solvent for pyroxylin P-373

Furies, or *Eumenides* (*yū-mēn'i-dēz*), in Greek and Roman mythology, goddesses who punished crime F-218

Furlong, Charles W. (born 1874), American explorer and writer; first American to explore Tripoli and to cross through heart of Tierra-del-Fuego ('The Gateway to the Sahara'; 'Tripoli in Barbary').

Fur'long, a unit of long and surveyors measure, table W-67

origin of word W-66

Furman University, at Greenville, S.C., Baptist institution founded 1826; arts and sciences, graduate school.

Furnace F-218-19. See also in *Index* Electric furnace

blast I-138, 142, pictures I-135, 136-7

copper roasting, picture C-359

fire prevention F-56

glass-making G-101, picture G-103

heat efficiency H-264

hot air H-264

hot water H-264, 265

household types H-264-5

humidity device H-264

iron smelting I-138, 142, pictures I-135, 136-7

linings: carborundum S-144; chromite C-230

medieval S-112

oil burning, picture H-265

open-hearth I-135, 144, pictures I-133, 139

reverberatory I-142, picture C-359

steam boiler S-282

steel making I-138, 142, pictures I-135, 136-7

Furness, Horace Howard (1833-1912), American Shakespearean scholar, born Philadelphia

'Variorum Shakespeare' S-100g

Furness, England, district of n.w. Lancashire, peninsula across Morecambe Bay from rest of county; hematite iron ore; extensive ruins of famous abbey, early English chapter-house and cloisters.

Furn'iss, Harry (1854-1925), Irish caricaturist, author, lecturer; for many years on staff of *Punch*, to which he contributed 'Diary of Toby, M.P.'; illustrated works of Dickens and Thackeray, A'Beckett's 'Comic Blackstone'; wrote

and illustrated 'Confessions of a Caricaturist' and other books; a powerful, versatile draftsman.

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Furnivall, Frederick James (1825-1910), English philologist; founded Early English Text Society, Chaucer Society, and other societies for publication of texts; edited 'Six-Text Print of Chaucer's Canterbury Tales'; directed publication of 43 facsimiles of quartos of Shakespeare's plays, and many early English works.

Furring, strips of wood on the inside of a brick, stone, or concrete wall to hold the lath and plaster.

Furs and fur trade F-223-8. See also in *Index* names of principal furbearing animals. For list of principal furs see table on preceding pages

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Fur seal arbitration (Bering Sea) S-70, H-230

Furtwängler (*fort'veng-lēr*), Wilhelm (born 1886), German musician; guest conductor, New York Philharmonic Orchestra, 1925-26; appointed director of Berlin State Opera, 1936.

Fury and Hecla Strait, narrow channel in Arctic North America between Cockburn Land and Melville Peninsula, and connecting the Gulf of Boothia with Foxe Channel.

Furze, *gorse*, or whin, spiny shrubs comprising the genus *Ulex* of the pulse family native to Europe and n.w. Africa; used for fences, as winter food for live stock, and for fuel; *Ulex europaeus* has been introduced into the United States.

Fusan (*fū-sūn'*), chief seaport of Korea, in s.e.; opened to foreign trade 1876; pop. 205,000; map A-332b

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Fuselage (*fū'sē-lāj*), of airplane A-75, 79, picture A-79

Fuse levee, in flood control F-106c

Fu'sel oil, a poisonous liquid consisting mainly of amyl alcohols, formed in fermentation; used in paints and varnishes.

Fushun (*fū-shūn'*), Manchukuo, city in Fengtien province, about 30 mi. e. of Mukden, on railway connecting Mukden and Harbin; large coal fields; pop. over 100,000; map M-49a

Fusing point. See in *Index* Melting point

Füssen (*fū'sēn*), Germany, historic town 58 mi. s.w. of Munich; peace signed here between Elector Maximilian III, Joseph of Bavaria, and Maria Theresa, 1745.

Fust, or *Faust*, Johann (died 1466?), German money-lender, associated with Gutenberg in invention of printing P-346, 347, picture B-191

Fustian (*fūs'chān*), name given to various coarse cotton or cotton and linen fabrics, especially a corded cloth similar to corduroy.

Fust'ic, a yellow dye D-121, 122

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FWA (Federal Works Agency) R-146g, U-232

Fyleman, Rose (born 1877), English writer of children's stories and poems, chiefly about fairies; also singer and lecturer; born Nottingham; taught school; studied music in London, Berlin, and Paris ('Fairies and Chimneys'; 'The Fairy Flute'; 'A Princess Comes to Our Town'; 'Twenty Tea Time Tales').

Fyn. See in *Index* Fünen